19th Joint Conference on Chemistry

"Empowering Sustainability: Harnessing Chemistry to Shape an Eco-Friendly World Across All Aspects of Life"

Abstract Book

12th September 2024

UNS Tower, Central Java, Indonesia

Sponsored by:

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WIRALAB ANALITIKA SOLUSINDO

Welcome Letter from Conference Chair

Assalamualaikum wr wb.

On behalf of the organizing committee of JCC 2024, Universitas Sebelas Maret, I would like to express my sincere appreciation to all of you for your cooperation and collaboration in making this annual scientific conference on chemistry possible. It is my pleasure to meet you all and facilitate the exchange of ideas for the development of chemistry and chemical education, both within the region of Central Java and worldwide.

I hope that our conference will have a positive impact on the chemistry community, not only regionally but also globally, through the scientific ideas and publications that emerge from this event. Furthermore, I am hopeful that our collaboration will continue and intensify through joint research among consortium members in the near future. This year, participants from several countries have contributed to the success of this conference, and I look forward to sharing new ideas in chemistry and chemical education together.

Lastly, I hope that through this conference, we as chemists can contribute to the development of human life through our knowledge.

Wassalamualaikum wr.wb

Surakarta, 12 September 2024

Prof. Dr. rer. nat. Atmanto Heru Wibowo
Chairman of JCC 2024

Welcome Letter from Head of Department of Chemistry, Sebelas Maret University

Head of Chemistry Departement, Mathematics and Natural Sciences, Sebelas Maret University.

Dear Delegates and Guests,

On behalf of the Department of Chemistry at Sebelas Maret University, I am delighted to extend a warm welcome to all of you attending the 19th Joint Conference on Chemistry (JJC), taking place in Surakarta, Central Java, on 12 September 2024. This prestigious annual event brings together leading minds in the field to engage in the exploration of both the scientific and practical aspects of chemistry. It serves as an invaluable platform for exchanging ideas, discovering new opportunities, reconnecting with colleagues, forming new collaborations, and expanding your professional horizons.

This year's theme, "Empowering Sustainability: Harnessing Chemistry to Shape an Eco-Friendly World Across All Aspects of Life," emphasizes the critical role that chemistry plays in promoting sustainable solutions. We aim to foster vibrant discussions that will enhance innovative research in this ever-evolving field. We are confident that the conference will lead to fruitful discussions and successful outcomes.

As with previous editions, we anticipate this year's event to be a dynamic environment for intellectual exchange. Chemistry thrives on both research and innovation, and it is essential that we leverage our strengths in these areas to further establish ourselves as global leaders. The broad range of topics covered in this year's program reflects the depth and significance of the role chemists play. By participating, you not only demonstrate your ability to assimilate this wealth of knowledge but also your capacity to apply it for real-world impact.

I would like to extend my sincere gratitude to each participant for your invaluable contributions to this conference. I also wish to thank the consortium members, whose unwavering support has been crucial to the event's success year after year. Finally, my deepest appreciation goes to the dedicated Organizing and Scientific Program committees for their tireless work in making this event possible.

Warm regards,

Dr. Abu Masykur, M.Si.
Head of Department of Chemistry,
Sebelas Maret University

Welcome Letter from Head of Department of Chemistry, Diponegoro University

Foreword

It is with great pleasure and anticipation that we welcome you to the **19th Joint Conference on Chemistry (JCC)**, organized by **Sebelas Maret University**. This conference, a distinguished program of the **Consortium of Chemistry Departments from seven leading universities**—Diponegoro University, Sebelas Maret University, State University of Semarang, Jenderal Soedirman University, Satya Wacana Christian University, Walisongo Islamic University, and Muhammadiyah University of Semarang—continues the tradition of fostering collaboration, sharing knowledge, and advancing scientific innovation in the field of chemistry.

Over the years, the JCC has served as a vital platform for scholars, researchers, and industry experts to exchange cutting-edge ideas and explore new scientific frontiers. The 19th iteration of this conference is particularly significant, as it reflects the resilience and adaptability of the scientific community in the face of global challenges. This year's theme, **"Empowering Sustainability: Harnessing Chemistry to Shape an Eco-Friendly World Across All Aspects of Life"**, underscores the urgent need for sustainable solutions in addressing pressing environmental, technological, and societal issues.

As part of this prestigious gathering, we are honored to host participants from a wide spectrum of expertise, including academics, practitioners, and students, whose diverse contributions are integral to the advancement of chemical sciences. We believe that this conference will not only inspire meaningful discourse but also foster collaborations that extend beyond national and disciplinary boundaries, enriching our collective understanding and pushing the limits of what chemistry can achieve.

We extend our deepest gratitude to all the organizing committees, distinguished speakers, and participants who have made this conference possible. May the 19th JCC be a catalyst for scientific breakthroughs, new partnerships, and shared visions that will help shape a brighter and more sustainable future for all.

Head of Chemistry Department

Diponegoro University

Prof. Adi Darmawan, Ph.D.

Welcome Letter from Head of Department of Chemistry, Universitas Negeri Semarang

Assalamu'alaikum warahmatullahi wabarakatuh,

I extend to you all our warmest welcome to Joint Conference on Chemistry (JCC) hosted by UNS, and Consortium of Chemistry Department in Central Java (UNNES, UNDIP, UNSOED, UIN Walisanga, and UNIMUS).

This is the 19th Joint International Conference on Chemistry. The conference theme is "Empowering Sustainability: Harnessing Chemistry to Shape an Eco-Friendly World Across All Aspect of Life". Through this conference, it is expected that we can create a discussion forum to improve the innovative research on chemistry in this era. We hope that the conference will be conducted successfully and deliver a fruitful discussion.

Lastly, I would like to congratulate all the contributors whose papers are presented in this prestigious conference. It is expected that this conference will bring significant and valuables ideas to improve our research and innovation to the education system in Indonesia and the world.

Ladies and Gentlemen,
Members of the Organizing Committee have been working very hard. I would like to thank them for their dedication, time, and effort. Thank you all for your presence and participation and you are the very important part of this conference success. Thank you and enjoy the conference

Best regards,

Wassalamu'alaikum warahmatullahi wabarakatuh.

Department of Chemistry

Universitas Negeri Semarang

Prof. Dr. Nanik Wijayati, M.Si.

Welcome Letter from Head of Department of Chemistry, Jenderal Soedirman University

Assalamualaikum Warrahmatullahi wabarakatuh

With great pleasure, we warmly welcome you to the 19th Joint Conference on Chemistry (JCC) hosted by UNS and the Consortium of Chemistry Department in Central Java (UNNES, UNDIP, UNSOED, UIN Walisanga, and UNIMUS).

As a consortium member, we are truly honored to contribute to this important gathering. This year's conference theme is "Empowering Sustainability: Harnessing Chemistry to Shape an Eco-Friendly World Across All Aspects of Life." It resonates deeply with the urgent need for sustainable solutions in our ever-evolving world. This theme speaks to the essence of innovation, collaboration, and progress.

We are privileged to gather with some of the most brilliant minds and thought leaders in chemistry. This conference is expected to serve as a knowledge exchange and inspiration center, featuring keynote addresses, invited lectures, presentations, and interactive discussions. Together, we will explore the extensive possibilities and opportunities at the nexus of chemistry.

I would like to thank the organizing committee for their commitment, time, and effort. To all scientists, researchers, industry professionals, and student participants, I extend a warm invitation to engage fully in this enriching experience. As we convene here in Surakarta, let us capitalize on this opportunity to establish new partnerships, foster fresh concepts, and delineate a path toward an Eco-Friendly world.

Best regards,
Wassalamu'alaikum warrahmatullahi wabarakatuh.

Department of Chemistry
Jenderal Soedirman University

Dr. Suwandri, S.Si., M.Si

Welcome Letter from Head of Department of Chemistry, Satya Wacana Christian University

Ladies and `Gentlemen, distinguished guest, fellow chemist, and esteemed colleagues

It's a great honor and privilege for us, the Department of Chemistry, Satya Wacana Christian University (SWCU) to be one of the organizing committees of 19th Joint Conference on Chemistry, an annual conference organized by the consortium of Chemistry Department of seven universities in Central Java. We are gathered here at this conference to explore the theme "Empowering Sustainability: Harnessing Chemistry to Shape an Eco-Friendly World Across All Aspects of Life".

In an era where the challenges of sustainability are more pressing than ever, chemistry stands at the forefront as a beacon of hope and innovation. Our discipline is uniquely positioned to offer solutions that can transform our world – solutions that are not just theoretical but actionable, and that can be integrated in to every aspect of life, from the materials we use to the energy we consume, and the food we grow.

As we embark on this journey, let us embrace the opportunity to share our knowledge, challenge our assumptions, and collaborate on groundbreaking research that will pave the way for a more sustainable future. Let us be inspired by the idea that through chemistry, we can indeed empower sustainability and shape a world where eco-friendly practices are not just an aspiration but a reality.

I extend my heartfelt gratitude to all organizing committee, Sebelas Maret University as the institution host, and all participants for making this conference possible. From this gathering, we hope the rich discussion and innovative ideas will emerge.

Thank you, and let us have a fruitful and inspiring conference

Best regards,

November Rianto Aminu, S.Si., M.Sc.
Head of Chemistry Department, SWCU

Welcoming Remarks from Head of Chemistry Department UIN Walisongo Semarang

Assalamualaikum Warahmatullaahi Wabarakaatuh,
Good morning, everyone. May God bless us all.

The honorable, Ladies and gentlemen of JCC 2024 participants.

First of all, we are happy to be a part of the 19th Joint Conference on Chemistry 2024, with the following universities: Sebelas Maret University (UNS), Diponegoro University (UNDIP, Semarang State University (UNNES), Jenderal Soedirman University, Muhammadiyah University of Semarang (UNIMUS), and Satya Wacana Christian University (UKSW). In this opportunity, we would like to extend our sincere gratitude and appreciation to the Chemistry Department of Sebelas Maret University for their role in preparing this conference possible. Then, we would like to express our gratitude to all of the participants who came from a variety of nations and universities for taking part in this event.

This event serves as a venue for researchers, educators, students, and industry professionals to communicate their knowledge, share their thoughts, discuss the new finding for science development, especially chemistry. We believe this chemistry event has much benefits to stimulate future collaborations among reseachers, industries, and government, contributing to the global strategies formulation for advancing the chemical science as well as the development of policy initiatives in the community. Hopefully, this forum will develop into a long-term agenda. Have a wonderful conference and enjoy Solo, the spirit of Java. I look forward to seeing you at JCC 2025.

Thank you

Semarang, September 2024
Head of Chemistry Department UIN Walisongo Semarang

Wirda Udaibah, M.Si

Welcome Address by the Chair of the Chemistry Education Study Program, UNIMUS

Assalamu'alaikum. Wr. Wb

Ladies and Gentlemen,

Distinguished Guests, Esteemed Colleagues, and Dear Participants,

It is my great honor and privilege to welcome you all to the 19th Joint Conference on Chemistry 2024. This year's theme, *"Empowering Sustainability: Harnessing Chemistry to Shape an Eco-Friendly World Across All Aspects of Life,"* resonates deeply with the urgent global need to develop and implement sustainable solutions in every facet of our lives.

Chemistry, as a fundamental science, holds the power to unlock innovative pathways to sustainability. From renewable energy and green materials to sustainable agriculture and pollution control, the role of chemistry is indispensable in addressing the challenges of our time. This conference serves as a platform for the exchange of ideas, the dissemination of cutting-edge research, and the fostering of collaborations that will drive the future of sustainable development.

I would like to extend my heartfelt thanks to all the speakers, presenters, and participants who have come from near and far to contribute to this important dialogue. Your dedication and passion for advancing the field of chemistry in the service of humanity and the planet are truly inspiring.

I also want to express my gratitude to the organizing committee for their hard work and meticulous planning, which have made this event possible. Without your commitment, this gathering of minds and ideas would not have been realized.

As we embark on this journey over the next few days, I encourage each of you to engage fully in the discussions, to challenge conventional thinking, and to explore new frontiers in sustainable chemistry. Together, we can harness the power of chemistry to create a better, more sustainable future for all.

Thank you, and I wish you all a fruitful and inspiring conference.

Wassalamu'laikum Wr, Wb

The Chair of the Chemistry Education Study Program, UNIMUS

Fitria Fatichatul Hidayah, S.Si, M.Pd

JOINT CONFERENCE IN CHEMISTRY 2024 UNS

CONFERENCE PROGRAMME

September 12, 2024

6.30-09.00	Registration	3rd floor Ball room
07.30 – 09.00 Session I	Parallel Class A	2nd floor room 1
	Parallel Class B	2nd floor room 2
	Parallel Class C	4th floor meeting room
	Parallel Class D	5th floor Room 1
	Parallel Class E	5th floor Room 2
	Parallel Class F	8th floor meeting room
	Parallel Class G	3rd floor Ball room
09.00 – 09.15	Morning Coffee/Poster session	
09.15 – 09.45	Plenary Session I Prof. Claudio Tiribelli	3rd floor Ball room Moderator: Prof. Dr. rer. nat. Witri Wahyu Lestari
09.45 – 10.15	Plenary Session II Prof. Dr. Eddy Heraldy	
10.15 – 10.25	Discussion	
10.25 – 10.55	Plenary Session III Prof. Tetsu Yonezawa	3rd floor Ball room Moderator: Assoc. Prof. Dr. rer. nat Fajar R. Wibowo
10.55 – 11.25	Plenary Session IV Prof. Santiago Gómez-Ruiz	
11.25 – 11.35	Discussion	
11.35 – 12.00	Conference Grand Opening 1. Dance Performance: Sundanese Dance with Balinese Fusion 2. Singing Indonesian National Anthem 3. Remarks: - Chairman Committee - Rector of Universitas Sebelas Maret	3rd floor Ball room

JOINT CONFERENCE IN CHEMISTRY 2024 UNS

CONFERENCE PROGRAMME

September 12, 2024

12.00 – 12.45	Breaks	
12.45 – 13.15	Plenary Session V Assoc. Prof. Dr. Mohd Khalizan Sabullah	3rd floor Ball room Moderator: Prof. Venty Suryanti, Ph.D.
13.15 – 13.45	Plenary Session VI Assoc. Prof. Oki Muraza	
13.45 – 13.55	Discussion	
13.55 – 15.25 Session 2	Parallel Class A	2nd floor room 1
	Parallel Class B	2nd floor room 2
	Parallel Class C	4th floor meeting room
	Parallel Class D	5th floor Room 1
	Parallel Class E	5th floor Room 2
	Parallel Class F	8th floor meeting room
	Parallel Class G	3rd Ball room
15.25 – 15.40	Afternoon Coffee	
15.40	Closing Ceremony	3rd floor Ball room

Plenary

Plenary 1

Recent Advances in Drug Delivery Systems for Liver Cancer Therapy

Claudio Tiribelli and Caecilia Sukowati

Fondazione Italiana Fegato ONLUS
Trieste, Italy

ABSTRACT

Important advances in biotechnologies, nanotechnologies, and biochemistry opened a new landscape in developing anticancer drugs, including in developing novel molecular targeted drugs. It is also valid for hepatocellular carcinoma (HCC), the most common type of liver cancer and the third leading cause of cancer-related death worldwide. Nevertheless, specific targeting of these molecular drugs in HCC is still hampered by various obstacles, including poor biological distribution and pharmacokinetics, poor target selectivity, high resistance, and high toxicity to non-targeted tissues. Thus, new approaches to a selective drug delivery system, with high efficacy in cancer cells and minimal toxicity to normal cells, are still needed. One of the reasonable methods for targeted drug delivery is the use of engineered nanoparticles (NPs). The NPs, natural or chemically synthesized, possess multiple advantages such as payload stability, tumor-specific delivery, high intracellular uptake, high surface-to-volume ratio, ability to co-encapsulate numerous therapeutic agents, and the ability to enhance bioavailability. The modifications of NPs surface properties also allow for enhanced delivery. The interdisciplinary applications of NPs open new opportunities and at the same time, new challenges, for HCC therapy. Considering the complexity of HCC, combining an efficient and potent molecular drug(s) and the use of an efficient cancer-targeted delivery system(s) will improve the success of the treatments, especially for patients in the later stages of the disease where the curative treatments options are considerably limited.

Plenary 2

Utilization of low-cost magnesium sources for struvite production

Eddy Heraldy

Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret

Abstract

Studies on the utilization of low-cost magnesium sources such as seawater, brine, and desalination waste as precursors in struvite production has been explored by researchers. These studies generally use precipitation methods that focus on the effects of various operational parameters such as pH, and ion concentrations on struvite crystallization at room temperature. The pH of magnesium sources was not adjusted before the reaction. Struvite crystal characterization was performed by X-ray diffraction (XRD), scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). The XRD analysis shows the formation of struvite crystals, SEM images show that struvite has irregular shapes in various morphologies and the FTIR spectrum of struvite shows the presence of hydration water, P-O bonds, N-H bonds, and metal-oxygen bonds. Characterization of the precipitate structure confirmed that crystallized struvite was the major product. Simultaneous precipitation of various compounds such as calcium phosphates and calcium carbonate should be considered and minimized to improve the quality of the struvite produced. The results show that all of them are acceptable as magnesium sources for struvite production. Compared with seawater, the desalination-waste is an alternative richer, environmentally friendly, and more sustainable magnesium source for struvite synthesis.

Keywords: brine, desalination-waste, low-cost magnesium, seawater, struvites

Eddy Heraldy (eddyheraldy@staff.uns.ac.id)

Plenary 3

Oxidized Copper Nanoparticles for Low-Temperature Sintering in Power Electronics Applications

Tetsu Yonezawa

Hokkaido University

Abstract

In the context of Sustainable Development Goals (SDGs), the demand for efficient power modules, particularly in applications like inverters, has grown significantly in recent years. Power semiconductors, essential in electronic devices ranging from household appliances to transportation systems, require effective heat management, especially as the use of wide bandgap semiconductors increases, leading to operational temperatures that can exceed 200 Â°C. Traditional lead-free solder, commonly used for material bonding, becomes less practical under these conditions due to its high melting point. Â To address this challenge, sintering-based materials have emerged as a promising alternative for conductive and joining applications. Although silver offers high electronic and thermal conductivity, its high cost and issues with ion migration restrict its broader application in high-end electronics. Copper, being significantly less expensive than silver and having lower migration concerns, stands out as a viable alternative. However, copper's susceptibility to oxidation, particularly in fine particles or nanoparticles, presents challenges such as combustion in air, unless protected by passivation layers. Â In this study, we have focused on controlling the oxidative state and crystalline structure of self-prepared copper nanoparticles. By employing alkylcarboxylic acid molecules, we successfully protected the particles, allowing them to be dispersed in high concentrations (up to 80 wt%) within a high-boiling-point liquid medium. High-resolution TEM (HR-TEM) and X-ray diffraction (XRD) analyses revealed the presence of a Cu64O phase, which converted into metallic copper at temperatures below 100 Â°C during sintering. The resulting pastes demonstrated significant necking even at 150 Â°C, indicating strong bonding potential. The die-attach joints achieved shear strengths exceeding 20 MPa, while the conductive materials exhibited a conductivity of 10^-5 Î©â€¢cm.

Keywords: Copper, Nanoparticles, Low-temperature sintering, Conductive materials, Joinings

Tetsu Yonezawa (tetsu@eng.hokudai.ac.jp)

Plenary 4

Theranostic Systems in Biomedicine: Integrating Imaging and Therapy in Metallodrug-Functionalized Nanostructured Materials

Santiago Gómez-Ruiz, Victoria García-Almodóvar, Diana Díaz-García, Javier Álvarez-Conde, Miguel Díaz-Sánchez, Julia Díaz-Magdaleno, Sanjiv Prashar, Josefa Ortiz-Bustos, Isabel del Hierro, Helena Pérez del Pulgar and Inés García-Benito

COMET-NANO Group, Departamento de Biología y Geología, Física y Química Inorgánica, Universidad Rey Juan Carlos, C/ Tulipán s/n, 28933, Móstoles (Madrid), Spain

Abstract

Theranostics, the integration of therapy and diagnosis, is a burgeoning field in biomedicine, offering significant advancements in early diagnosis and effective treatment. In drug delivery, theranostics has spurred the development of multifunctional nanoplatforms that combine molecular imaging fragments with therapeutic compounds, demonstrating remarkable efficacy in both preclinical and clinical trials. Our research group has focused on creating theranostic systems for cancer treatment by integrating potent therapeutic metallodrugs with imaging agents within nanostructured materials. We have designed, synthesized, and characterized a diverse array of theranostic systems, including mesoporous silica nanoparticles (MSNs), fibrous silica particles (FSPs), and N-functionalized graphene quantum dots (NGQDs) loaded with tin, copper, ruthenium, or silver agents, among others [1]. These innovative nanomaterials, co-functionalized with targeting agents, have shown promising in vitro and in vivo results against some cancer and / or bacterial models. In addition, the experience of our team in designing these kinds of materials has recently allowed us to tackle more complex dysfunctions, such as neurodegenerative or neuromuscular diseases [2]. This presentation will highlight our group's recent work, emphasizing the synthesis and characterization techniques, as well as the biological studies that reveal the critical relationship between the structural features and composition of drug-delivery systems and their therapeutic efficacy. Our findings pave the way for the future design of metallodrug-functionalized nanomaterials with potential clinical applications.

References

[1] See for example: a) K. Ovejero-Paredes, et al. Cancers 2020, 12, 187; b) P. C. Choudante, et al. Biomaterials Adv. 2022, 137, 212819; c) M. Ugalde-Arbizu, et al. Pharmaceutics, 2023, 15, 560; d) I. J. Gómez, et al. Chemistry Eur. J. 2023, 29, e202301845; e) V. García-Almodóvar et al. Advanced Therapeutics, 2024, 2400114; f) V. García-Almodóvar et al. J. Mater. Chem. B, 2024, in press: DOI: 10.1039/D4TB01106F.

[2] D. Díaz-García et al. ACS Biomaterials Sci. Eng. 2022, 8, 4838.

Acknowledgements

We would like to thank funding from the research project PID2022-136417NB-I00 financed by MCIN/AEI/10.13039/501100011033/ and "ERDF A way of making Europe", and from the Research Thematic Network "METALBIO" RED2022-134091-T financed by MCIN/AEI/10.13039/501100011033.

Keywords: Theranostics, multifunctional nanoplatforms, drug-delivery systemss

Santiago Gómez-Ruiz (santiago.gomez@urjc.es)

Plenary 5

An Innovative Biosensing Approaches for Environmental Pollution Monitoring: Cholinesterase Enzymes as Key Detectives

Assoc. Prof. Dr. Mohd Khalizan Sabullah

BioAgriTech Research (BioATR) Group, Faculty of Science and Natural Resources, Universiti Malaysia Sabah

Abstract

Contamination of pesticides and heavy metals in the environment, especially in water and soil, poses serious threats to human health and ecosystems. Although undeniable accuracies of classical methods for detecting these contaminants, such as chromatography and spectrophotometry, these methods are costly, time-consuming, and require sophisticated analytical systems. Nowadays, biosensors are considered a promising alternative for preliminary screening of environmental contamination. This review focuses on the development and application of cholinesterase; ChE, as a source of biosensor tool for the detection of pesticides and heavy metals. ChE, is highly sensitive to these types of toxicants, making them ideal substrates for biorecognition in biosensor systems. Inhibition of ChE activity by pesticides such as organophosphates and carbamates, as well as by heavy metals can be qualitatively or semi-quantitatively measured, providing a direct determination of pollution levels. The application of ChE-based biosensor offers several advantages over conventional detection methods. It is cost-effective, making it widely available even in resource-limited environments. The identification process is rapid, typically producing results within minutes, which is crucial for timely decision-making in environmental monitoring. Furthermore, these biosensors are user-friendly and require minimal technical training, making them widely applicable to nonexpert operators. The integration of such biosensors into environmental monitoring programs could significantly enhance the ability to protect public health and maintain ecological integrity.

Keywords: biosensor, cholinesterase, pesticides, heavy metalss

Assoc. Prof. Dr. Mohd Khalizan Sabullah (khalizan@ums.edu.my)

Plenary 6

Development of Different Feedstocks for Bioethanol Production

Oki Muraza, Nelliza Putri, Rachma Fitriani, Hary Nugroho

Pertamina Technology Innovation

Abstract

Pertamina continues to sharpen competencies and expand collaboration to encourage the development and utilization of bioenergy in various sectors particularly bioethanol for gasoline blending. The sugar industry, while vital and productive, cannot supply enough molasses to sustain the ambitious goals set by the nation's renewable energy policies. As a result, Indonesia faces a pressing need to diversify its feedstock sources to ensure a stable and continuous supply of bioethanol. The development of feedstocks for bioethanol production is crucial for advancing renewable energy technologies.

This year, Pertamina has successfully produced and tested bioethanol from sorghum. we are also exploring other sugar-based feedstocks, such as Nypa fruticans, one of the 42 mangrove species found in Indonesia. In order to meet future bio-based fuel demands, we are also exploring other waste feedstock, such as palm oil empty fruit bunches (EFB). These 2G bioethanol process capitalizes on lignocellulosic materials which are typically regarded as waste in the palm oil industry, thereby providing a sustainable approach to bioethanol production. EFB available in large number since Indonesia is the largest palm oil producer in the world.

In conclusion, seeking alternative feedstocks for bioethanol is not just a strategic move, but a crucial necessity for achieving Indonesia's net-zero emissions target and ensuring energy security. By diversifying feedstocks, we can reduce dependence on traditional resources, enhance sustainability, and lower greenhouse gas emissions. Embracing innovative feedstock solutions will pave the way for a greener, more secure future, driving Indonesia toward a sustainable energy landscape and a cleaner planet.

PARALLEL SESSION I

Parallel A

Moderator : Dr. Edi Pramono.

Room : 2nd floor room 1

No	Time	Name	Afiliation	Title
1	**07:30 - 07:42**	**Edi Pramono**	**UNS**	**PVDF/Sulfonated Chitosan Membrane Performance on Dye Filtration: Permeability, Selectivity and antifouling properties**
2	07:43 - 08:20	Fatin Junaidah binti Mohamad Fazli	Universiti Malaysia Sabah	Synthesis, Structure Elucidation and Flame Retardancy of Cyclotriphosphazene Derivatives via Schiff based-Amide Formation with Hydrazine Bridge Linkage.
3	07:43 - 08:20	Eugene Julius Chang	UNDIP	Realizing Scalable Small-Flake Graphene Oxide Membrane for Desalination
4	07:43 - 08:20	Akbar Satrio Perdana	UNDIP	Self-Cleaning Membrane Composite GO/G-C3N4/ZnO For Enhance Water Purification
5	07:43 - 08:20	Diyah Tri Utami	UNS	The Antibacterial Activity of Ethanol Extract of Combination Papaya Leaves (Carica Papaya) And Cherry Leaves (Muntingia calabura) Liquid Soap against Staphylococcus epidermidis ATCC 12228
6	08:22 - 08:59	Rivina Oktafiani	UNS	Effect of B_2O_3/ZnO substitution on Physical Properties of Boro-tellurite Glasses
7	08:22 - 08:59	Dadan Hadian	ITB	Superhydrophobic and antibacterial coatings of TiO2/ZnO/SiO_2 composite for self-cleaning applications on sanitaryware products
8	08:22 - 08:59	Ratu Asha Kirana Aurellia	UNS	Synthesis and Characterize Di(L-Methioninato) Nickel(II)Monohydrate Complex
9	08:22 - 08:59	Khairin Nafiis	ITS	Nanofiltration performance of polyether sulfone (PES)/graphene oxide-silica (GO-SiO_2) mixed matrix membrane (MMM) in urea and creatinine removal from hemodialysis wastewater

Materials Chemistry_70

PVDF/Sulfonated Chitosan Membrane Performance on Dye Filtration: Permeability, Selectivity and antifouling properties

Edi Pramono | Andi Aisyah Macorawalie | Reza Zatadini

Chemistry Department Faculty of Mathematics and Natural Science Universitas Sebelas Maret |
Chemistry Department Faculty of Mathematics and Natural Science Universitas Sebelas Maret |
Chemistry Department Faculty of Mathematics and Natural Science Universitas Sebelas Maret

Abstract

Membrane development in improving membrane performance including rejection percentage and antifouling properties through composition modification is quite challenging. This study aims to examine the effect of adding sulfonated chitosan (ChS) to PVDF membranes on dye filtration performance and antifouling properties. The membranes were prepared by phase inversion and characterized in terms of functional groups, morphology, porosity, hydrophilicity, water flux, dye rejection, and antifouling properties. The data showed that the addition of ChS increased the hydrophilicity of the membrane surface. The PVDF-ChS membrane showed higher water flux and dyes rejection than the PVDF membrane. The addition of ChS resulted in dye filtration performance with rejection rates above 90% for Methylene Blue (MB) and 87.65% for Reactive Yellow 145 (RY145). The analysis of antifouling properties, through the determination of the flux recovery ratio (FRR), produced above 90% for both MB and RY145. Thus, the modification of PVDF membranes with ChS provides an effective technique with high potential for dye filtration applications.

Keywords: Antifouling, Dyes filtration, membrane, PVDF, Sulfonated Chitosan

Presenter: Edi Pramono (edi.pramono.uns@staff.uns.ac.id)

Synthesis, Structure Elucidation and Flame Retardancy of Cyclotriphosphazene Derivatives via Schiff based-Amide Formation with Hydrazine Bridge Linkage.

Fatin Junaidah binti Mohamad Fazli

Organic Synthesis and Advanced Materials (OSAM) Research Group, Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia

Abstract

A new structure of cyclotriphosphazene derivatives via Schiff base-amide formation with hydrazine bridge linkage attached to different terminal ends either from alkyl chain lengths of octyl (5a) or from a functional group of hydroxy (5b) was successfully synthesized and characterized. Fourier-transform infrared (FTIR), nuclear magnetic resonance (NMR), and CHN elemental analysis were used to characterize the structure of these compounds. The fire retardancy property of these compounds was studied through limiting oxygen index (LOI) by using epoxy resin (EP) as a molding matrix. Throughout the study, all final compounds showed an increasing value of LOI that was more than pure EP, which is 22.75%. The highest value of LOI is 28.53% from the hydroxyl group (5b) attachment at the terminal end, which successfully passed the standard flame retardant value (25.00%) in showing self-extinguisher behavior. The LOI result would have to show a correlation in char layer morphology using a Scanning Electron Microscope (SEM) with their thermal behavior through Thermogravimetric Analysis (TGA). Based on that, compound 5b appears to have the best thermal stability, forming a condensed and compact morphology of the char layers to prevent the fire from spreading.

Keywords: Cyclotriphosphazene, Schiff base-amide, hydrazine bridge, flame retardant

Presenter: Fatin Junaidah binti Mohamad Fazli (fatinjunaidah18@gmail.com)

Nanomaterials_90

Realizing Scalable Small-Flake Graphene Oxide Membrane for Desalination

Eugene Julius Chang

Diponegoro University

Abstract

A safe method for achieving a graphene oxide membrane with "small-flake" properties is described below. The preparation of graphene oxide is done by excluding the use of NaNO3, that produces toxic gas, and the usage of 9:1 H2SO4/H3PO solution with an increased amount of KMnO4. Steps is also taken to allow a significant temperature increase to 80oC that is necessary to achieve an end product with the desired properties. We have found that such a material with those particular properties provide a significant boost in nano-filtration applications especially for water treatment and desalination purpose. The membranes that are produced by the thermally reduced form of the synthesized graphene oxide has been tested to reach a perfect salt rejection state and a relatively high water permeance (13,1 L m- 2 h- 1 bar- 1). The membranes also demonstrated high stability throughout multiple days in our experimental long-term use case scenario. This new breed of graphene oxide membranes with its minimal modifications to the most common syntheses method shows promise in approaching real world application for water purification. Fourier Transform Infrared analysis was done to confirm that the material was indeed graphene oxide and X-Ray Diffraction was also done to determine the interlayer distance of the membrane which was 8.093 Å

Keywords: Graphene Oxide, Desalination, Small-Flake, Membrane, Water Permeance

Presenter: Eugene Julius Chang (eugene@students.undip.ac.id)

Self-Cleaning Membrane Composite GO/g-C_3N_4/ZnO For Enhance Water Purification

Akbar Satrio Perdana

Diponegoro University

Abstract

Major challenge in the practical application of membrane technology for wastewater treatment and purification are membrane fouling. Graphene Oxide (GO) as a promising nanofiltration material, however it easy to fouling with organic pollutant. Therefore, we used graphitic carbon nitride (g-C3N4) and ZnO as support material with good photodegradation performance. In this study, we developed a simple and effective method to insert g-C3N4/ZnO between GO nanosheets and crosslinking with anhidrid maleic to fabricated composite membrane GO/g-C3N4/ZnO. With this reasonable modification, the water permeability of membrane is as high as 168,9 L.m-2.h-1.bar-1 and rejection of Naphthol Blue Black (NBB) up to 99.99% and sustained more than 90% up to 4 cycles of reuse with UV irradiation treatment at each cycle transition for the self-cleaning mechanism process. Therefore, the GO/g-C3N4/ZnO membrane may be used for dye removal from waste water with recycling abilities for the realization of large-scale wastewater purification.

Keywords: Graphene Oxide, Graphitic Carbon Nitride, Self-Cleaning Membrane, Water Purification, Nanofiltration Membrane

Presenter: Akbar Satrio Perdana (akbarsatriop@students.undip.ac.id

Pharma_158

The Antibacterial Activity of Ethanol Extract of Combination Papaya Leaves (*Carica Papaya*) And Cherry Leaves (*Muntingia calabura*) Liquid Soap against *Staphylococcus epidermidis* ATCC 12228

Dwi Nurma Widayanti, Diyah Tri Utami

Department of Pharmacy, Vocational School, Universitas Sebelas Maret, Jl. Ir. Sutami 36A, Surakarta, 57126, Indonesia, Department of Pharmacy, Vocational School, Universitas Sebelas Maret, Jl. Ir. Sutami 36A, Surakarta, 57126, Indonesia

Abstract

Liquid soap is a topical preparation for keeping the body's skin clean. Skin problems are generally caused by bacterial activity. Antibacterial treatment from chemicals such as antibiotics can cause serious side effects, so it is necessary to look for other agents that are more effective and easy to use, one of which is making liquid soap by adding natural extracts. This study aims to determine variations in the combination of ethanol extracts of papaya leaves and cherry leaves in the physical and chemical evaluation of liquid soap preparations and to determine the antibacterial activity against Staphylococcus epidermidis ATCC 1228. This research evaluated liquid soap preparations, including organoleptic tests, homogeneity tests, pH tests, foam height tests, water content tests, and antibacterial activity with cup-plate diffusion tests. Comparison of the ethanol extract content of papaya leaves: cherry leaves, namely formula 1 (4:5), formula 2 (4.5:4.5), formula 3 (3:6), negative control, and positive control dettol. The resistance diameter data was analyzed using statistical tests. The conclusion of this study is that the liquid soap preparation combined with ethanol extract of papaya leaves and cherry leaves had a strong antibacterial activity with a maximum average inhibition zone diameter in formula 3, namely 21.44mm.

Keywords: Liquid soap, Staphylococcus epidermidis ATCC 12228, antibacterial activity, Carica Papaya, Muntingia calaburas

Presenter: Diyah Tri Utami (diyahtriutami12@staff.uns.ac.id)

Materials Chemistry_25

Effect of B_2O_3/ZnO substitution on Physical Properties of Boro-tellurite Glasses

Rivina Oktafiani | Ahmad Marzuki | Harjana | Devara Ega Fausta | Ari Handono Ramelan | Artono Dwijo Sutomo | Hery Purwanto

Physics Department, Faculty Mathematics and Natural Science, Universitas Sebelas Maret Surakarta

Abstract

Boro-tellurite glasses with compositions (in mol%) 60TeO2-(30-x)B2O3-7TiO2-(3+x)ZnO (where x = 0, 1, 2, 3, 4, 5, 6, 7, and 8 mol%) were successfully fabricated. Melting was carried out at 950oC for 45 minutes. For homogenization, all the obtained glasses were annealed at 285oC for 8 hours, followed by cooling to room temperature at a cooling rate of 10C/minute. The effect of B2O3/ZnO substitution on the physical properties of boro-tellurite glass was evaluated. Density measurement for all glasses was carried out at room temperature using a pycnometer. From the measurement, it was found that the density of boro-tellurite glass increased from 3.667 to 4.736 g/cm3. Utilizing density data, several physical properties parameters were derived, including molar volume, polaron radius, inter-ionic distance, field strength, and Oxygen Packing Density (OPD). The glass molar volume, polaron radius, and inter-ionic distance decrease, whereas the field strength and oxygen packing density increase. These results indicate that ZnO acts as the network modifier and changes the boro-tellurite glass network. Besides the physical properties, the water contact angle of all glasses was measured using the liquid drop method and processed further using ImageJ software. For this purpose, the contact angle was analyzed using Low-Bond Axisymmetric Drop Shape Analysis (LB-ADSA) and Drop Snake Analysis (DSA). From both methods, it was found that the water contact angle of the investigated glasses is in the range of 56.17 to 85.43 degrees, indicating that they are all hydrophilic glasses.

Keywords: Boro tellurite glass, inter-ionic distance, oxygen packing density, polaron radius, water contact angle

Presenter: Rivina Oktafiani (rivinaoktafiani@student.uns.ac.id)

Materials Chemistry_26

Superhydrophobic and antibacterial coatings of $TiO_2/ZnO/SiO_2$ composite for self-cleaning applications on sanitaryware products

Dadan Hadian | Anita Alni | Aep Patah | Muhammad Ali Zulfikar

Institut Teknologi Bandung | Institut Teknologi Bandung | Institut Teknologi Bandung | Institut Teknologi Bandung

Abstract

This study aims to produce a superhydrophobic and antibacterial coating that has good adhesion to sanitaryware substrate. TiO2/ZnO/SiO2 (TZS) nanocomposite has been coated on a sanitaryware substrate using PDMS (Poly Dimethyl Siloxane) as adhesive media through a spray coating method to produce a superhydrophobic surface with contact angle value reaching 159.4°. The results of the adhesion test using the cross-cut section method show that the TZS coating belongs to ASTM 5B/ISO class 0 with no peeling areas during the test. SEM and AFM images show that the TZS coating consists of peaks and valleys resulting in a high degree of roughness to form a superhydrophobic surface. The antimicrobial testing showed that the number of bacteria adhering to sanitaryware surfaces was significantly reduced (88 %) on the superhydrophobic TZS coating. The TZS coating on the sanitary substrate is superhydrophobic, has good adhesion, and has antibacterial properties, so it has promising materials to be applied as a self-cleaning medium on sanitaryware products.

Keywords: superhydrophobic coating, $TiO_2/ZnO/SiO_2$ composite, good adhesion, antibacterial properties

Presenter: Dadan Hadian (dadanhadian029@gmail.com)

Materials Chemistry_29

Synthesis and Characterize Di(L-Methioninato) Nickel(II)Monohydrate Complex

Ratu Asha Kirana Aurellia | Sentot Budi Raharjo

Universitas Sebelas Maret

Abstract

Abstract. The aim of this study is to synthesis and characterize a complex of Nickel(II) with L-Methionine ligand. The Nickel(II)-(L-Methionine) complex was synthesized by mixing NiSO4.6H2O with L-Methionine at a mole ratio of 1:2 metal to ligand in distilled water. The complex was characterized by UV-Vis Spectrophotometer, Atomic Absorption Spectrophotometry (AAS), Differential Thermal Analyzer (DTA), IR Spectrum, Magnetic Susceptibility Balance (MSB), and X-Ray Diffraction (XRD). The formation of the complexes is indicated by the shift of the maximum wavelength (λmax) around 4.5 nm for the Ni(II)-(L-methionine) complex. The result of AAS analysis showed Ni content in Ni(II)-(L-methionine) complex was 15.96 ± 0.2%. Thermal analysis showed the presence one of water molecules in the complex. The corresponding complex formula is [Ni(L-methionin)2].H2O. The electronic spectra of the [Ni(L-methionin)2].H2O complex showed 2 absorption peaks at 390.50 nm and 721.50 nm correspond to the 3A2g ® 3T1g(P) (ν3) and 3A2g ® 3T1g(F) (ν2) transitions, indicating the complex is octahedral in shape. The IR spectra showed the -NH2 and -COO- groups of L-methionine coordinated to the metal. The complex is paramagnetic with meff = 3,00 ± 0,02 BM.

Keywords: Synthesis, [Ni(L-methionine)2].H2O, paramagnetic, octahedral

Presenter: Ratu Asha Kirana Aurellia (ratuasha.kirana@gmail.com)

Materials Chemistry_35

Nanofiltration performance of polyether sulfone (PES)/graphene oxide-silica ($GO\text{-}SiO_2$) mixed matrix membrane (MMM) in urea and creatinine removal from hemodialysis wastewater

Khairin Nafiis | Rafli Ahmad Nurdiansyah | Reno Penggalih | Callysta Prastika Kusumawardhani | Muhammad Aqbil Wildani

Institut Teknologi Sepuluh Nopember | Institut Teknologi Sepuluh Nopember | Institut Teknologi Sepuluh Nopember | Institut Teknologi Sepuluh Nopember | Institut Teknologi Sepuluh Nopember

Abstract

Hemodialysis treatment produces gallons of wastewater containing urea and creatinine, potentially polluting nature. The incineration method used for its wastewater treatment can produce carbon dioxide -and nitrous oxide which have further impacts on the environment. This research aims to fabricate and evaluate the nanofiltration performance of polyethersulfone-based membrane modified with graphene oxide-silica composites for urea and creatinine removal from hemodialysis wastewater. The added composite, synthesized by the sol-gel method, is expected to decrease pore size and increase hydrophilicity, thus optimizing membrane rejection rate and flux. The characterized peak of the COO-Si bond at 1400.32 cm--1 in IR spectra shows the successful synthesis of graphene oxide-silica composite. SEM images show decreasing surface roughness as composite concentration increases, indicating a decrease in pore size, where the 5%wt variation has the most smooth surface followed by the 4%wt variation. The drop shape analysis result shows the increase of hydrophilicity as the concentration of the composite increases, with the 5%wt variation as the most hydrophilic, followed by the 4%wt variation in the second place. The pure water flux test shows the high and stable flux of the 4%wt variation at 31.23 LMH, whereas the 5% variation has the lowest flux at 11.1 LMH. Filtration test and UV-Vis analysis results show that the 5%wt variation has the highest urea and creatinine rejection rates which are 50.57% and 43.82%, slightly different from the 4%wt variation with 41.63% and 43.22%. Based on overall performance, the 4%wt variation membrane shows the most optimal performance in hemodialysis wastewater treatment.

Keywords: urea, creatinine, graphene oxide-silica composite, nanofiltration, hemodialysis wastewater

Presenter: Khairin Nafiis (khairinnafis8@gmail.com)

Parallel B

Moderator: Dina Fitriana M.Sc

Room: 2nd floor Room 2

No	Time	Name	Afiliation	Title
1	**07:30 - 07:42**	**Zuhair Jamain**	**Universiti Malaysia Sabah**	**Synthesis and Molecular Design of Liquid Crystalline Ester-Based Cyclotriphosphazene Compounds with Promising Fire Retardant Properties**
2	07:43 - 08:20	Nur Atika binti Waldin	Universiti Malaysia Sabah	Synthesis and Characterization of Triazole-based Compounds with Different Terminal Groups as a Potential in Therapeutic Applications
3	07:43 - 08:20	Fastabiqul Khoirot	UNS	Synthesis, Characterization, and Antibacterical Activity of Nickle(II) Complexes with Benzimidazole
4	07:43 - 08:20	Felli Rusumayanti	UI	Synthesis of Tin oxide nanoparticles by Thermal Oxidation Assisted by Oxidizing Agents
5	07:43 - 08:20	Dina Fitriana	UNS	The Removal of Cadmium Ions from Aqueous Solutions by Dithizone-Immobilized Coal Fly Ash
6	08:22 - 08:59	M Alvien Ghifari	Institut Teknologi Sumatera	Activated and Fe_2O_3 pillared Clay from Natar as Potential Adsorbents for Free Fatty Acids and Peroxides in Waste Cooking Oil
7	08:22 - 08:59	Albert Suryadinata	ITB	Improving Electrochemical Performance of Ni-rich NMC Cathode Materials by Aluminum Doping for Lithium-ion Batteries
8	08:22 - 08:59	Indra Surya	Universitas Sumatera Utara	Effect of varying amounts of filler addition on the degree of filler dispersion and stress-strain behavior of coal fly ash-based silica/natural rubber composite
9	08:22 - 08:59	Henny Purwaningsih	IPB University	Preparation and Characterization of Polyvinyl Pyrrolidone-Graphane Composite films

Materials Chemistry_58

Synthesis and Molecular Design of Liquid Crystalline Ester-Based Cyclotriphosphazene Compounds with Promising Fire Retardant Properties

Zuhair Jamain | Melati Khairuddean | Tay Guan-Seng

Organic Synthesis and Advanced Materials (OSAM) Research Group, Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia | School of Chemical Scicenses, Universiti Sains Malaysia, 11800 Penang, Malaysia | School of Industrial Technology, Universiti Sains Malaysia, 11800 Penang, Malaysia

Abstract

A new hexasubstituted cyclotriphosphazene compounds with two ester linking units were successfully synthesized and characterized. Within this series, homologs were attached to terminal substituents, such as heptyl, tetradecyl, chloro, and nitro groups. The characterization of cyclotriphosphazene compounds involved spectroscopic techniques, including Fourier transform infrared spectroscopy (FTIR), nuclear magnetic resonance spectroscopy (NMR), and CHN elemental analysis. The liquid crystal properties of these compounds were evaluated using polarized optical microscopy (POM). Observation under POM shows that all these compounds displayed mesogenic behavior, exhibiting nematic phases during cooling and heating cycles. The phase transitions were further confirmed by differential scanning calorimetry (DSC). Two endotherms were observed for the transition of crystal-nematic-isotropic phases. Moreover, the fire retardant properties of hexasubstituted cyclotriphosphazene compounds were examined using the limiting oxygen index (LOI) test, with polyester resin (PE) as the molding matrix. The pure PE has the LOI value of 22.53%, which increased to 24.71% when blended with 1 wt.% of hexachlorocyclotriphosphazene (HCCP), demonstrating excellent fire retardant properties. Further modification of HCCP with organic side arms showed that all compounds exhibited fire retardant properties, as indicated by their LOI values. In this study, the compound with a nitro terminal group achieved the highest LOI value of 27.37%. This indicates that the electron-withdrawing character of the nitro group contributed to the fire retardancy.

Keywords: Cyclotriphosphazene; Ester Linkage; Liquid Crystal; Fire Retardant; Terminal Group

Presenter: Zuhair Jamain (zuhairjamain@ums.edu.my)

Materials Chemistry_39

Synthesis and Characterization of Triazole-based Compounds with Different Terminal Groups as a Potential in Therapeutic Applications

Nur Atika binti Waldin | Zuhair Jamain

Organic Synthesis and Advanced Materials (OSAM) Research Group, Faculty of Science and Natural Resources, Universiti Malaysia Sabah | Organic Synthesis and Advanced Materials (OSAM) Research Group, Faculty of Science and Natural Resources, Universiti Malaysia Sabah

Abstract

Synthetic chemistry has continually evolved to produce various compounds with potential therapeutic applications. Among these, triazole-based compounds have garnered significant attention due to their diverse biological activities. This study focuses on the synthesis and characterization of triazole-based compounds with dodecyl and nitro terminal groups. Their structures were confirmed using Fourier-transform infrared spectroscopy (FTIR), nuclear magnetic resonance spectroscopy (NMR), and CHN elemental analysis. The appearance of two doublets in the 1H NMR spectrum indicates that the benzene ring is in the para position. Furthermore, the dodecyl signals are found in the upfield region of the NMR spectrum. Meanwhile, the toxicity of these compounds at different concentrations, ranging from 12.5 to 200 ppm, was evaluated using Brine Shrimp Lethality Test (BSLT) to assess their safety profile. The results indicated LC50 values of 163.39 and 2167.14 ppm for dodecyl and nitro terminal groups, respectively. This evaluation highlights the need for further optimization to enhance their therapeutic potential while minimizing adverse effects. This research aims to contribute to the growing body of knowledge in synthetic chemistry, offering insights into the development of safer and more effective triazole-based therapeutics.

Keywords: Synthesis, triazole-based, therapeutic, toxicity.

Presenter: Nur Atika binti Waldin (atikawaldin@gmail.com)

MatChem_170

Synthesis, Characterization, and Antibacterical Activity of Nickle(II) Complexes with Benzimidazole

Fastabiqul Khoirot, Sentot Budi Rahardjo, Witri Wahyu Lestari

Sebelas Maret University, Sebelas Maret University, Sebelas Maret University

Abstract

In general, the complex will have more effective antibacterial activity than the ligand or metal. The objective of this research are to know the synthesis, characteristics and antibacterial activity of complex nickel(II) with benzimidazole against Staphylococcus aureus and Escherichia coli. The complex of Ni(II)-benzimidazole was synthesized by mixed in 1:3 mol ratio of NiCl2.6H2O and benzimidazole in methanol and refluxed for two hours. The formation of complex was indicated by colour changing and shifting of λmaks to the shorter wavelength. The analysis of Ni contain in the complex, Thermogravimetric Analysis (TGA), conductivity measurement, and AgCl precipitate analysis shows that the complex formula was [Ni(Benzimidazole)3(H2O)2CI]CI.H2O. Water molecules acts crystal and ligand, and chloride ions (Cl-) as counter ion and ligand. The ratio of cation and anion charges in the complex is 1:1. IR spectra indicated that benzimidazole was monodentate coordinated through primary amine group and imine group. The [Ni(Benzimidazole)3(H2O)2CI]CI.H2O is paramagnetic with μeff 2,96 BM. The electronic spectra shows two absorption peaks at 669 nm dan 400 nm as transition 3A2g(F)→3T1g(F) and 3A2g(F)→3T1g(P), and accurate octahedral geometry. Antibacterial activity of [Ni(Benzimidazole)3(H2O)2CI]CI.H_2O shows too weak to against Staphylococcus aureus and Escherichia coli.

Keywords: Benzimidazole, Characterization, Ni(II) complex, Antibacterials

Presenter: Fastabiqul Khoirot (fkhoirot@student.uns.ac.id)

Materials Chemistry_89

Synthesis of Tin oxide nanoparticles by Thermal Oxidation Assisted by Oxidizing Agents

Felli Rusumayanti | Mohammad Nasikin | Wahyu Bambang Widayatno | M. Ikhlasul Amal

Departement of Chemical Engineering, Faculty of Engineering, University of Indonesia | Departement of Chemical Engineering, Faculty of Engineering, University of Indonesia | Research Center for Materials, Nasional Research and Inovation Agency (BRIN) | Research Center for Nanotechnology System, Nasional Research and Inovation Agency (BRIN)

Abstract

Tin Oxide (SnO2) was synthesized using the thermal oxidation method with tin metal powder precursors as raw materials as well as the use of Nitric Acid (5% and 10%) and the addition of oxidizers in the form of sulfuric acid with a concentration of 5%. The synthesis operates at a temperature of 120 °C with optimal stirring. The synthesized samples were calcined at temperatures of 400 °C and 500 °C. Phase analysis of the sample structure using X-Ray Diffraction (XRD) which confirmed the formation of the tetragonal crystal structure of SnO2, the composition of the sample was analyzed using X-Ray Fluoroscence (XRF), Sample particle size analysis (PSA) showed that the synthesized SnO2 material was in the range of 850 nm. Surface morphology and particle size confirmed through FESEM and HRTEM showed the formation of an agglomeration of SnO2 with a size of 82 nm.

Keywords: SnO2, Thermal Oxidation, X-Ray Diffraction

Presenter: Felli Rusumayanti (felli.rusumayanti@office.ui.ac.id)

The Removal of Cadmium Ions from Aqueous Solutions by Dithizone-Immobilized Coal Fly Ash

Dina Fitriana | Mudasir | Dwi Siswanta

Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret | Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Gadjah Mada | Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Gadjah Mada

Abstract

The adsorption of Cd(II) ions onto dithizone-immobilized coal fly ash (DCFA) was done using batch experiments. In this study, coal fly ash was first activated by HCl followed by modified its surface with dithizone. The immobilization of activated coal fly ash (ACFA) with dithizone has been carried out to increase the adsorption capacity as the adsorbent of Cd(II) ions. The synthesized adsorbent, i.e., dithizone-immobilized coal fly ash (DCFA) and the original activated coal fly ash (ACFA) were characterized by FT-IR, XRD, TGA-DTA, adsorption-desorption N2, and SEM to confirm the successful immobilization of dithizone on the activated coal fly ash. Several parameters influencing the adsorption of Cd(II) ions such as the effect of pH, adsorbent dosage, contact time, and initial concentration of metal ions on the adsorption efficiency were optimized. The results show that the adsorption kinetics was found to follow a pseudo-second-order kinetic model and their adsorption isotherms are best described by the Langmuir model. Kinetics and adsorption isotherm studies suggest that the capacity and affinity of the DCFA in adsorbing Cd(II) ions is improved compared to those of non-immobilized activated coal fly ash (ACFA). Sequential desorption using different solvents of H2O, KNO3, HONH2HCl, and Na2EDTA revealed that binding Cd(II) ions to the adsorbents primarily involves chemisorption. The type of interaction shifts significantly from being predominantly electrostatic (ion exchange) in ACFA to primarily involving chelate complexation in DCFA.

Keywords: adsorption, coal fly ash, immobilization, dithizone, cadmium

Presenter: Dina Fitriana (dina.fitriana@mail.ugm.ac.id)

Materials Chemistry_44

Activated and Fe_2O_3 pillared Clay from Natar as Potential Adsorbents for Free Fatty Acids and Peroxides in Waste Cooking Oil

Mufid Rizky Hartoyo | Arfa Sari Goreta Ginting | Yayuk Astuti | Bambang Ari Wahjoedi | M Alvien Ghifari

Department of Chemistry, Institut Teknologi Sumatera, Jalan Terusan Ryacudu, Lampung Selatan, Lampung, 35365, Indonesia | Department of Chemistry, Institut Teknologi Sumatera, Jalan Terusan Ryacudu, Lampung Selatan, Lampung, 35365, Indonesia | Department of Chemistry, Universitas Diponegoro, Jalan Prof. Soedharto, S.H. Tembalang, Semarang 50275, Indonesia | Department of Material Engineering, Institut Teknologi Sumatera, Jalan Terusan Ryacudu, Lampung Selatan, Lampung, 35365, Indonesia | Department of Chemistry, Institut Teknologi Sumatera, Jalan Terusan Ryacudu, Lampung Selatan, Lampung, 35365, Indonesia

Abstract

Waste cooking oil (WCO) is characterized by high levels of free fatty acids (FFA) and peroxides, which hinder its further utilization. Effective reduction of FFA and peroxide content through adsorption techniques is crucial to enhance the reusability of WCO. This study presents activated and Fe2O3-pillared clay from Natar as promising adsorbents for reducing FFA and peroxide content in WCO. Morphological observations reveal that the activated and Fe2O3-pillared Natar clay exhibits smaller particle sizes, which are advantageous for adsorption compared to unmodified Natar clay. X-ray diffraction (XRD) analysis indicates that the Natar clay primarily consists of kaolinite, with quartz as an impurity. The observed shift in basal spacing (001) confirms successful interlayer modification. The surface area and pore volume of acid-activated Natar clay are measured at 46.706 m2/g and 0.228 cm3/g, respectively, while Fe2O3-pillared Natar clay exhibits a surface area of 78.406 m2/g and a pore volume of 0.247 cm3/g. The modified Natar clay demonstrates significant potential as an adsorbent for FFA and peroxides. Acid-activated Natar clay and Fe2O3-pillared Natar clay reduce FFA by up to 50% and 70%, respectively. Furthermore, the peroxide value is reduced by 78% with acid-activated Natar clay and by 85% with Fe2O3-pillared Natar clay. This research advances adsorption technology for the reduction of FFA and peroxides in WCO using modified Natar clays.

Keywords: activated clay, Fe2O3 pillared clay, free fatty acid, kaolinite, peroxide value

Presenter: M Alvien Ghifari (m.ghifari@ki.itera.ac.id)

Materials Chemistry_46

Improving Electrochemical Performance of Ni-rich NMC Cathode Materials by Aluminum Doping for Lithium-ion Batteries

Albert Suryadinata

Institut Teknologi Bandung

Abstract

Nickel-rich LiNixM1-xO2, x ≥ 0.8, cathodes are regarded as a potential material for high-energy-density lithium-ion batteries. However, these cathodes suffer from capacity fading during prolonged cycles due to their high nickel content, whereas increasing nickel is crucial to increase the specific capacity. Additionally, the high cobalt content in this cathode is also a concern due to its volatile price and scarce availability. Several efforts to address these problems are still underway. Among various approaches, doping with Al has been confirmed to improve the cyclability of materials by stabilizing the layered structure.Herein, the electrochemical performance of Ni-rich LiNi0.85Mn0.07Co0.08O2 is improved via Al doping by substituting Co with Al. This improvement is explained by the increase in Li-slab in the doped cathode, facilitating better diffusivity during the charging/discharging processes. Electrochemical testing indicates that doping with aluminum improves the performance as the doping content increases from 0 to 4%-mol. A further increase after 4%-mol results in counterproductive consequences, including a decrease in initial capacities. The optimal doping mol-% proposed in this research is between 2% and 4%-mol as they provide a balance between capacity and cyclability. Overall, this research investigates the effects of aluminum doping substituting cobalt on the layered oxide cathode materials.

Keywords: Ni-rich cathode, NMC, Aluminum doping, Li-ion battery, Electrochemistry

Presenter: Albert Suryadinata (albertsuryadinata02@gmail.com)

Materials Chemistry_83

Effect of Varying Amounts of Filler Addition on The Degree of Filler Dispersion and Stress-Strain Behavior Of Coal Fly Ash-Based Silica/Natural Rubber Composite

Indra Surya

Universitas Sumatera Utara

Abstract

Abstract. The stress-strain behavior of natural rubber (NR) composites is critically influenced by the addition of filler particles, particularly silica. This study investigates how varying amounts of silica affect the degree of filler dispersion and mechanical properties of NR composites. Using a typical semi-efficient rubber compound formulation, silica varying from 10 to 40 phr was added to the NR mixture and subjected to tensile tests. The results reveal a significant correlation between filler amount, filler degree dispersion, and the stress-strain response, where improved crosslink density, as the result of rubber-filler interaction enhancement, enhances the overall mechanical performance, including tensile strength, stiffness, and tensile moduli, but reduces elongation at break. Beyond the optimum silica amount, poor dispersion, characterized by accumulation, results in inferior mechanical properties due to stress concentration and reduced interfacial interaction between the rubber matrix and silica particles. This study underscores the importance of optimizing filler dispersion to achieve desirable mechanical properties in silica-reinforced natural rubber composites, and it was found that 30 phr of silica was the optimum filler loading for NR composite. The findings provide valuable insights for developing high-performance rubber materials with tailored stress-strain characteristics through controlled filler dispersion.

Keywords: degree of filler dispersion, stress-strain behavior, silica, natural rubber

Presenter: Indra Surya (isurya@usu.ac.id)

MatChem_152

Preparation and Characterization of Polyvinyl Pyrrolidone-Graphane Composite films

Henny Purwaningsih, Ahmad Sjahriza, Daffa Fatahillah

1. Department of Chemistry, IPB University; 2. Integrated Laboratory, IPB University, 1. Department of Chemistry, IPB University; 2. Integrated Laboratory, IPB University, Department of Chemistry

Abstract

In this study, composite films of polyvinyl pyrrolidone (PVP) and graphene oxide (GO) were prepared by solution casting. Graphene oxide (GO) has potential as a filler in making composite films. The carbon source for GO synthesis was obtained from areca nut seeds. Commercial PVP was used as composite's backbone. Investigation into composite films with various compositions were conducted. Fourier transform infrared (FTIR) spectroscopy, UV-Vis spectroscopy, X-ray powder diffraction (XRD), and Raman spectroscopy were used to examine the GO synthesis. Characterization results confirmed the successful of GO synthesis. The addition of GO to PVP matrix showed a significant increase in mechanical properties at 1% and 5% of GO content. The transmission rate and water vapor permeability decreased at 1% GO content but increased significantly at 3% and 5% of GO

Keywords: areca nut, composite film, graphene oxide, polyvinyl pyrrolidones

Presenter: Henny Purwaningsih (hennypu@apps.ipb.ac.id)

Parallel C

Moderator: Dr. Yuniawan Hidayat
Room: 4th floor room

No	Time	Name	Afiliation	Title
1	**07:30 - 07:42**	**Anas Santria**	**Osaka University**	**Computational Insights into J-L Interaction Modulation by Capping Ligands in Lanthanide-Monoporphyrin Complexes**
2	07:43 - 08:20	Nadza Basyuni Ramli	ITS	Prediction Vapor-Liquid Equilibria Using UNIFAC Model for Ethyl Acetate + Ethanol System with the Addition of Dimethyl Sulfoxide and Ethylene Glycol as Entrainer at 101.3 kPa
3	07:43 - 08:20	Ardiana Ilham Nurrohman	UNAIR	Molecular Modeling and Dynamics Study of G147R/H275Y Neuraminidase Mutant: Insights into Oseltamivir and Peramivir Resistance Mechanisms
4	07:43 - 08:20	Joko Tri Wibowo	BRIN	In Silico Analysis of the Synergistic Effects of Turmeric, Tamarind, and Ginger on the Immune System
5	07:43 - 08:20	Teguh Wibowo	UIN Walisongo Semarang	Impact of the Hands-On Activity Model (HOA) on High School Students' Systematic Thinking Skills in Learning Chemical Equilibrium
6	08:22 - 08:59	Dewi Muthiatur Roudloh	UIN Walisongo Semarang	Analysing Students' Scientific Argumentation Skills Using The Argument Based Science Inquiry (ABSI) Learning Model On Salt Hydrolysis Materials
7	08:22 - 08:59	Irma Rohmatun	UNS	Synthesis and Application of ZSM-5 From Rice Husk Waste Modified with Fe or Co Metal
8	08:22 - 08:59	Asyfia Zulfa Az Zukhruf	UNDIP	Study of interactions and molecular dynamics between E-Cadherin EC1-EC2 domains with Ac-CDTPVC-NH2 (ADTC5), Trimethyl Chitosan (TMCs) and Vitamin C.
9	08:22 - 08:59	I Putu Mahendra	Institut Teknologi Sumatera	Enhancing the mechanical properties of silk fibroin through the incorporation of bacterial cellulose

Computational Insights into J-L Interaction Modulation by Capping Ligands in Lanthanide-Monoporphyrin Complexes

Anas Santria

Osaka University

Abstract

This study explores the interaction between the total angular momentum from the f-electron system J and the orbital angular momentum from the photoexcited cyclic π electronic system L in lanthanide-monoporphyrin complexes, focusing on how different capping ligands influence this interaction. The objective was to understand the impact of ligand choice on the electronic structure and the interaction between angular momenta. Computational chemistry methods, including geometry optimization and electronic structure determination, were employed to analyze complexes with ligands such as 1,4,7,10-tetraazadodecane, 4,10-diaza-12-crown-4 ether, 1-aza-12-crown-4 ether, and 12-crown-4 ether. Results revealed that replacing nitrogen with oxygen in the capping ligand significantly altered the energy separation between sublevels and influenced the orientation of the main magnetic axis, particularly in the 1-aza-12-crown-4 ether complex. The study also confirmed the presence of a ferromagnetic-type and an antiferromagnetic-type interaction in the terbium and dysprosium complexes, respectively. These findings highlight the sensitivity of the electronic structure and magnetic properties to ligand composition, advancing our understanding of the J-L interaction in these systems.

Keywords: lanthanide complexes, J-L interaction, computational chemistry, magnetic properties, ligand effects.

Presenter: Anas Santria (asantria@chem.sci.osaka-u.ac.jp)

Computational Chemistry_13

Prediction Vapor-Liquid Equilibria Using UNIFAC Model for Ethyl Acetate + Ethanol System with the Addition of Dimethyl Sulfoxide and Ethylene Glycol as Entrainer at 101.3 kPa

Nadza Basyuni Ramli | Kuswandi

Department of Chemical Engineering, Faculty of Industrial Technology and Systems Engineering, Sepuluh Nopember Institute of Technology | Department of Chemical Engineering, Faculty of Industrial Technology and Systems Engineering, Sepuluh Nopember Institute of Technology

Abstract

The demand for ethyl acetate is continuously increasing as many industries are switching to using environmentally friendly solvents. Ethyl acetate is a potential compound because it has low toxicity and is biodegradable. However, its production using the esterification and ethanol dehydrogenation method still produces ethyl acetate that forms an azeotropic mixture with ethanol, resulting in low purity. Extractive distillation (ED) is a method used in industry for azeotrope separation. ED is a separation technique that modifies the relative volatility of the original mixture components by adding a third component known as an entrainer. Vapor-liquid equilibrium (VLE) data and thermodynamic model parameters are required as the basis for designing extractive distillation columns and optimizing the separation process. In this study, VLE data is predicted using the UNIFAC model for the ternary system ethyl acetate(1)+ethanol(2)+DMSO/EG(3) as entrainer with entrainer mole fractions of 0.15 and 0.2 at 101.3 kPa. This prediction method aims to determine the best entrainer and operating conditions for the ED process. The addition of entrainer can shift the azeotropic point from an ethyl acetate concentration of 53.7%mol to 74%mol and 82%mol with the addition of entrainer 0.15 and 0.2, respectively, where DMSO and EG produce a relatively similar shift.

Keywords: Entrainer, Ethyl Acetate, Extractive distillation, Vapor-liquid equilibrium

Presenter: Nadza Basyuni Ramli (nadzabasyuni20@gmail.com)

Computational Chemistry_52

Molecular Modeling and Dynamics Study of G147R/H275Y Neuraminidase Mutant: Insights into Oseltamivir and Peramivir Resistance Mechanisms

Ardiana Ilham Nurrohman | Hery Suwito | Ni Nyoman Tri Puspaningsih | Kautsar Ul Haq

Department of Chemistry, Faculty of Science and Technology, Universitas Airlangga | Department of Chemistry, Faculty of Science and Technology, Universitas Airlangga | Proteomic Laboratory, UCoE Research Center for Bio-molecule Research and Engineering, Universitas Airlangga | Department of Chemistry, Faculty of Science and Technology, Universitas Airlangga

Abstract

Influenza remains persistent global threat and has taken millions of lives. Neuraminidase is the most prominent target for influenza treatment since its inhibition disrupts viral progeny and disease progression while other therapeutic target was limited due to rapid mutation. Oseltamivir is the most widely used drug and peramivir is the latest approved drug by FDA for influenza treatment targeting this enzyme. Nonetheless, extensive use of these drugs can lead to resistance emergence due to selective pressure. G147R/H275Y mutation was reported to confer resistance to these drugs more than 1000 folds. Intriguingly, single mutation of G147R was reported not to confer resistance to these drugs, but combination of this mutant with H275Y confer greatly to resistance. However, study on this mutant was still limited due to the absent of crystallographic structure. Thus, the resistance mechanism of this mutant was still unknown. Here, we overcame this limitation using molecular modelling to construct G147R/H275Y mutant. We employed molecular dynamics simulation to explore its structural dynamicity over time. Trajectory analysis was employed to analyze its stability and flexibility. Furthermore, binding free energy was calculated to determine its binding affinity. We found that calculated binding energy of oseltamivir was highly correlated to the experimental data with Pearson correlation of 0.79. However, the peramivir was negatively correlated to the experimental data with Pearson correlation of -0.86. We also found that the salt-bridge formed by R224-E196 was slightly disrupted in the mutant. This change of interaction might be the source of the resistance.

Keywords: influenza, resistance, G147R/H275Y, molecular dynamics simulation, infectious disease, H1N1

Presenter: Ardiana Ilham Nurrohman (ardiana.ilham.nurrohman-2023@fst.unair.ac.id)

Computational Chemistry_56

In Silico Analysis of the Synergistic Effects of Turmeric, Tamarind, and Ginger on the Immune System

Joko Tri Wibowo

BRIN

Abstract

The use of traditional medicinal plants has gained renewed interest due to their potential health benefits and minimal side effects. This study investigates the synergistic effects of three well-known herbs: turmeric (Curcuma longa), tamarind (Tamarindus indica), and ginger (Zingiber officinale), on various health parameters. These plants are rich in bioactive compounds, such as curcumin, tartaric acid, and gingerol, known for their antioxidant, anti-inflammatory, and antimicrobial properties.To explore the combined health benefits, we conducted an in silico analysis using molecular docking and network pharmacology approaches. Key bioactive compounds from each plant were identified and their interactions with relevant molecular targets involved in inflammatory, metabolic, and immune pathways were studied. The docking studies revealed significant binding affinities of these compounds with targets such as COX-2, TNF-α, and NF-κB, suggesting potential synergistic effects in modulating inflammatory responses.Furthermore, network pharmacology analysis highlighted the complex interactions and pathways influenced by the combined use of these herbs. The analysis suggested that the combined effects could potentially enhance therapeutic outcomes, reduce inflammation, and improve immune responses, thus contributing to overall health and wellness.This in silico investigation provides a theoretical foundation for the development of novel therapeutic strategies using natural products. Further in vitro and in vivo studies are necessary to validate these findings and fully elucidate the clinical potential of the turmeric, tamarind, and ginger combination.

Keywords: jamu; turmeric; tamarind; ginger; immune system

Presenter: Joko Tri Wibowo (jk3wbowo@gmail.com)

Impact of the Hands-On Activity Model (HOA) on High School Students' Systematic Thinking Skills in Learning Chemical Equilibrium

Siti Rahmawati | Deni Ebit Nugroho | Teguh Wibowo

Department of Chemistry Education, Faculty of Science and Technology, Universitas Islam Negeri Walisongo Semarang | Department of Chemistry Education, Faculty of Science and Technology, Universitas Islam Negeri Walisongo Semarang | Department of Chemistry Education, Faculty of Science and Technology, Universitas Islam Negeri Walisongo Semarang

Abstract

Learning activities that do not involve students in the learning process cause students' system thinking skills to be less developed. The purpose of this study was to determine the effect of the Hands-on Activity model on students' system thinking skills in chemical equilibrium material. This type of research is a quasi-experiment with a Nonequivalent Control Group Design. The research sample consisted of XI-A5 and XI-A6 of SMAN 15 Semarang, which were taken using a purposive sampling technique. Hypothesis testing in this study used the Mann-Whitney U test with an Asymp.Sig. (2-tailed) value of 0.012. Based on the basis of decision making in the Mann-Whitney U test, if the Asymp.Sig. (2-tailed) value is smaller than the significance level (0.05), then Ha is accepted and Ho is rejected. Then, based on the effect size test conducted in this study, a value of 0.536 was produced, which indicates a moderate level of influence.

Keywords: chemical equilibrium; hands-on activity; system thinking

Presenter: Teguh Wibowo (teguhwibowo@walisongo.ac.id)

Analysing Students' Scientific Argumentation Skills Using The Argument Based Science Inquiry (ABSI) Learning Model On Salt Hydrolysis Materials

Dewi Muthiatur Roudloh | Hanifah Setiowati | Nana Misrochah

UIN Walisongo Semarang | UIN Walisongo Semarang | UIN Walisongo Semarang

Abstract

Critical thinking skills are one of the 21st century skills that can be developed through scientific argumentation skills. This research aims to analize students' scientific argumentation skills by applying the Argument Based Science Inquiry (ABSI) learning model on salt hydrolysis material. This study is quantitative descriptive research that describe scientific argumentation skills into five levels. The instrument used is an essay questions referring to Toulmin's Argumentation Pattern (TAP) which contains the components of claim, ground, warrant, backing, modal qualifier, and rebuttal. The research results show that students' argumentation skills by applying the ABSI learning model are 8% at level 3, 14% at level 4, and 34% at level 5. This is supported by the percentage of claim components (80%), ground (79%), warrant (78%), backing (71%), capital qualifier (48%), and rebuttal (47%). These findings shows that integrating the ABSI model in learning could improve students' argumentation skills.

Keywords: scientific argumentation skills, Argument Based Science Inquiry model, salt hydrolysis

Presenter: Dewi Muthiatur Roudloh (dewimuthia04@gmail.com)

Catalyst_163

Synthesis and Application of ZSM-5 From Rice Husk Waste Modified with Fe or Co Metal

Irma Rohmatun, Fusia Mirda Yanti, Khorina Dwi Nugrahaningtyas

Sebelas Maret University, Badan Riset dan Inovasi Nasional (BRIN), Sebelas Maret University

Abstract

This research aims to synthesize, characterize, and test the catalytic activity of ZSM-5, Fe/ZSM-5, and Co/ZSM-5 catalysts. The synthesis of ZSM-5 catalyst was made from hydrothermally processed rice husk ash using a Si/Al molar ratio of 40. Modifications of ZSM-5 with Fe and Co metals was made using 2.5% (w/w) through wet impregnation method. Catalyst characterization includes analysis of typical diffraction patterns using X-ray Diffraction (XRD), specific surface area using a Surface Area Analyzer (SAA), and surface morphology using Scanning Electron Microscope–Energy Dispersive X-Ray Spectroscopy (SEM-EDX). The catalytic activity test was carried out using a batch reactor at a pressure of 4 bar for 1 hour at a temperature of 150 oC. The resulting products gas was analyzed using a Gas Chromatography (GC) instrument. The results showed that ZSM-5 catalyst was successfully synthesized and could convert 22.86% of methane gas. However, after being modified with Fe and Co metals, the methane conversion percentage decreased to 18.62% and 1.99%.

Keywords: ZSM-5, Fe/ZSM-5, Co/ZSM-5 catalysts, partial oxidation of methane, rice husk.s

Presenter: Irma Rohmatun (irma.ir179@student.uns.ac.id)

Comp_155

Study of interactions and molecular dynamics between E-Cadherin EC1-EC2 domains with Ac-CDTPVC-NH2 (ADTC5), Trimethyl Chitosan (TMCs) and Vitamin C.

Parsaoran Siahaan, Dwi Hudiyanti, Muhammad Cholid Djunaidi

Departement of chemistry, faculty of sciences and mathematics, diponegoro university, Departement of chemistry, faculty of sciences and mathematics, diponegoro university, Departement of chemistry, faculty of sciences and mathematics, diponegoro university

Abstract

Treatment of brain diseases is difficult due to the presence of blood-brain barrier (BBB) formed by the interaction of E-Cadherin (EC) proteins. Drug delivery to the brain can be improved by inhibiting this interaction. Peptide ADTC5 (AcCDTPPVC-NH2) can inhibit the interaction between EC proteins. Trimethyl Chitosan (TMCs) is used as a drug carrier, while vitamin C functions as a strong antioxidant that neutralizes free radicals. This study aims to determine the resulting interaction between E-Cadherin domain EC1-EC2 with Ac-CDTPPVC-NH2 (ADTC5), Trimetyl Chitosan (TMCs) and Vitamin C using molecular docking, molecular dynamics and sequential docking methods. The results showed the interaction energy of the EC1-EC2…ADTC5, EC1-EC2…TMCs and EC1-EC2…Vitamin C complexes were -25.31 kJ/mol, -37.66 kJ/mol and -21.76 kJ/mol, respectively. Conformational changes in molecular dynamics affect the interactions that occur in the complex. The EC1-EC2...ADTC5 complex has the best stability during the simulation with an average binding free energy of -17.62 kJ/mol. The expected sequential docking is the EC1-EC2…ADTC5…VitC…TMCs complex with a system interaction energy of 37.19 kJ/mol.

Keywords: Intermolecular interactions, E-Cadherin, ADTC5, Trimethyl chitosan, Vitamin Cs

Presenter: Asyfia Zulfa Az Zukhruf (asyfiazulfaazzukhruf@students.undip.ac.id)

Poly_168

Enhancing the mechanical properties of silk fibroin through the incorporation of bacterial cellulose

I Putu Mahendra

Program Studi Kimia, Fakultas Sains, Institut Teknologi Sumatera

Abstract

Cartilage health and regeneration have been a significant challenge in the field of tissue engineering. The use of natural polymers, such as silk fibroin derived from the silkworm Bombyx mori and Muga, has shown promise in addressing this issue. This study aimed to explore the incorporation of bacterial cellulose into silk fibroin to enhance the mechanical properties of the resulting scaffold, making it a suitable candidate for cartilage regeneration. The fabricated silk fibroin/bacterial cellulose scaffolds exhibited a highly porous structure with excellent water uptake capacity and improved mechanical properties compared to pure silk fibroin, confirming the potential of the composite scaffold for cartilage regeneration. The cell viability assay and live/dead staining showed that the silk fibroin/bacterial cellulose scaffolds supported cell growth and maintained high cell viability, further demonstrating their suitability for cartilage tissue engineering applications. In conclusion, the incorporation of bacterial cellulose into silk fibroin effectively enhanced the mechanical properties of the scaffold, making it a promising candidate for cartilage regeneration and tissue engineering applications.

Keywords: Cartilage, Silk Fibroin, Bacterial Cellulose, Scaffold, Tissue Engineerings

Presenter: I Putu Mahendra (i.mahendra@ki.itera.ac.id)

Parallel D

Moderator: Prof. Dr. Khoirina Dwi N.

Room 5th floor Room 1

No	Time	Name	Afiliation	Title
1	**07:30 - 07:42**	**Diana Díaz-García**	**Universidad Rey Juan Carlos**	**Multifunctional Nanosystems For The Simultaneous Capture And Valorization Of CO_2 And N_2**
2	07:43 - 08:20	Karnelasatri	Universitas Pelita Harapan	Antibacterial Properties Of Extract And Fraction Of Biwa Stem Bark (*Eriobotrya japonica* (Thunb.) Lindl.) And Its Cream Formulation
3	07:43 - 08:20	Tejayani Nurroudhlotiningtyas	UNS	Effect of pH on the release of quercetin in a polyelectrolyte complex of chitosan and alginate crosslinked with Zn
4	07:43 - 08:20	Akhmad Sabarudin	UB	Silver Nanoparticles-mediated 3D-Connector Microfluidic Paper-Based Analytical Devices for Point-of-Care Testing of Glucose Ketone Index
5	07:43 - 08:20	Hafid Nur Himawan	UNS	Synthesis Of Oxidized Carbon Nanotubes/C60/Ferrocene And Modification Of Its Surface By Plasma Treatment
6	08:22 - 08:59	Yusuf Syahril Alam	ITS	Co(II), Ni(II), Cu(II), and Zn(II)-(E)-N'-(2-Hydroxybenzylidene)benzohydrazide Complexes : Design, Characterization, ADME Study, and Evaluation of Antibacterial Activity
7	08:22 - 08:59	Dini Aulia	Chulalongkorn University	Synthesis of 2,3-dioxopyrrolidine derivatives and evaluation of their inhibitory activity against NS5 methyltransferase of dengue virus
8	08:22 - 08:59	Setyanto Arief Wiedagdo	UNS	In Silico and In Vitro Study of Nanoliposome Extract from Cassia alata Coated with Chitosan-Folate to Breast Cancer Cells
9	08:22 - 08:59	Muhamad Maulana Yusuf	UNDIP	Synthesis Of Graphitic Carbon Nitride (G-C_3N_4) Composite With Cuo And Nio As A Photocatalist

Nano_174

Multifunctional Nanosystems For The Simultaneous Capture And Valorization Of CO_2 And N_2

Diana Díaz-García,[1] Javier Álvarez-Conde,[1] Julia Díaz-Magdaleno,[1] Miguel Díaz-Sánchez,[1] Victoria García-Almodóvar,[1] Isabel del Hierro Morales,[1,2] Josefa Ortiz-Bustos,[1] Sanjiv Prashar,[1,2] and Santiago Gómez-Ruiz[*,1,2]

[1] COMET-NANO Group, Department of Biology and Geology, Physics and Inorganic Chemistry, Universidad Rey Juan Carlos, Calle Tulipán s/n, E-28933, Móstoles (Madrid) Spain

[2] Instituto de Investigación de Tecnologías para la Sostenibilidad, Universidad Rey Juan Carlos, Calle Tulipán s/n, E-28933, Móstoles (Madrid) Spain

Abstract

The acceleration of globalization and the increase in industrial production have generated a significant increase in greenhouse gas emissions, as well as an increase in energy consumption. In this context, this work is part of the potential sustainable strategies to face this environmental challenge through the development of advanced gas capture and transformation technologies. To this end, multifunctional nanosystems capable of simultaneously capturing and transforming CO_2 and N_2 into valuable products, such as sustainable fuels or fuel precursors (CO and/or HCOOH, among others) and green ammonia, have been designed and developed through photocatalytic processes under mild conditions.

Currently, one of the most employed methods for CO_2 capture is the use of alkylamines, while organometallic complexes of metals such as Co(II) and Ru(II) have been reported for the reduction of this gas.[1] On the other hand, the use of new heterobimetallic complexes (mainly based on Fe, Ti and Cr) allows the activation of N_2 towards the formation of ammonia under mild conditions.[2]

This presentation will describe our strategy for the design of novel nanostructured materials functionalized with metal complexes for the simultaneous activation of CO_2 and N_2 focusing on the current work of our research team in this project. This communication will particularly describe the design and preparation of porous silica materials functionalized with polyamino groups for CO_2 capture as potential nanosupports for the incorporation of active molecules for the activation of CO_2 and N_2. In addition, this presentation will also describe our most recent results on the design, synthesis and characterization of cobalt(II) complexes and the preliminary study of their CO_2 catalytic, photocatalytic or photoelectrocatalytic transformation of CO_2 as well as their potential incorporation onto polyamino-functionalized silica-based nanostructures for the design of heterogeneous catalytic systems.

References

[1] Luo, Y.-H. et al. Coord. Chem. Rev, 2019, 390, 86–126
[2] Doyle, L. R. et al. Angew Chem. Int. Ed. Engl., 2019, 58, 6674-6677

Acknowledgments
This work is part of the I+D+I project TED2021-132175B-I00 funded by MCIU/AEI/10.13039/501100011033/ and by the European Union NextGenerationEU/ PRTR.

Keywords: CO2 capture, nanostructured, metal complexess

Diana Díaz-García (diana.diaz@urjc.es)

Antibacterial Properties of Extract and Fraction of Biwa Stem Bark (*Eriobotrya japonica* (Thunb.) Lindl.) and its Cream Formulation

Karnelasatri | Candra Yulius Tahya | Sri Wahyu Ningsih Munthe | Adinda Kurnia | Ifanema Fajar Harapan Telaumbanua | Jessica Novia

Universitas Pelita Harapan | Universitas Pelita Harapan | Universitas Pelita Harapan | Universitas Pelita Harapan | Universitas Pelita Harapan | Universitas Pelita Harapan

Abstract

Biwa stem bark (*Eriobotrya japonica*) (Thunb.) Lindl) has antibacterial potential. This study aimed to determine the antibacterial activity of extract and fractions of biwa stem bark against Staphylococcus aureus using the disc diffusion method. LCMS/MS analysis was carried out to determine the compounds that have the potential as antibacterial agents for the bacteria above and the formulation of fractions as active compounds in a cosmetic made in cream formulation tested for quality and stability by the cycling test method. The antibacterial assay of the extract at test concentrations of 10,000 ppm, 100,000 ppm, and 500,000 ppm showed resistant (9.25 mm), intermediate (17.50 mm), and susceptible (23.63 mm) activities, respectively. Meanwhile, at the same test concentration, ethanol fraction showed intermediate (14.19 mm), intermediate (16.81 mm), susceptible (23.31 mm), while ethyl acetate fraction showed intermediate (13.37 mm), intermediate (15.12 mm), susceptible (20.93 mm). The results of statistical testing with Anova and post hoc Tamhane revealed that both fractions had equal activity. LCMS/MS analysis identified kaempferol-3-O-(2G-α-L-rahmnosyl)-rutinoside, nigakinone, and isoxanthohumol as the compounds with the highest response. Both nigakinone and isoxanthohumol are reported to have antibacterial activity. The cream formulation at a 1% concentration of ethanol and ethyl acetate fractions showed inhibition in the resistant category (10,33 mm and 10,92 mm respectively). The cream formulation was stable on organoleptic parameters, homogeneity, pH, spreadability, adhesiveness, and viscosity which did not change during the cycling test.

Keywords: Biwa bark, antibacterial, Staphylococcus aureus, LCMS/MS, cream formulation

Presenter: Karnelasatri (karnelasatri@gmail.com)

Effect of pH on The Release of Quercetin in A Polyelectrolyte Complex of Chitosan and Alginate Crosslinked With Zn

Budi Hastuti | Tejayani Nurroudhlotiningtyas | Saptono Hadi

Universitas Sebelas Maret | Universitas Sebelas Maret | Universitas Sebelas Maret

Abstract

Chitosan and alginate was functional biomaterials that was biodegradable and potentially used as drug delivery materials. Chitosan alginate Polyelectrolyte complex membrane crosslinked with Zn in delivering quercetin into the body by release testing with pH variation of dissolution media. The chitosan alginate membrane crosslinked with Zn and loaded with quercetin produced a polyelectrolyte complex with not easily torn and elastic properties. FTIR spectra of chitosan-alginate membrane crosslinked with Zn loaded with quercetin showed the formation of polyelectrolyte complexes with a shift in characteristic peaks and the formation of new characteristic groups, namely Zn-O at a wavelength of 548.77 cm-1 and phenol at 1379.47 cm-1. Scanning Electron Microscopy (SEM) testing showed that the membrane surface was fibrous and quercetin was successfully loaded. Entrapment Efficiency (EE) testing gave a relatively high result of 91 ± 0.08%. The release of quercetin from Zn-crosslinked chitosan alginate membrane was carried out with pH variation of dissolution media with pH 1.2; 5.0; and 7.4, the results showed the highest release at pH 7.4. The membrane prelease followed the Korsmeyer-Peppas model and the release mechanism followed fick diffusion.

Keywords: Chitosan, alginate, Zn, quercetin, drug release

Presenter: Tejayani Nurroudhlotiningtyas (tejayani.tyas@student.uns.ac.id)

Silver Nanoparticles-mediated 3D-Connector Microfluidic Paper-Based Analytical Devices for Point-of-Care Testing of Glucose Ketone Index

Akhmad Sabarudin | Elizabeth T.A. Setiawan | Mentari S. Chandra | Firanissah N. Azizah | Layta Dinira | Hermin Sulistyarti | Ika O. Wulandari | Ahmad L. Fahmi | Kamila R. \'Aisy | Krista F. S. Putri

Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia | Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia | Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia | Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia | Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia | Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia | Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia | Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia | Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia | Department of Chemistry, Faculty of Science, Brawijaya University, Jl. Veteran 12-16 Malang 65145, Indonesia

Abstract

Diabetes mellitus, a leading cause of mortality, is characterized by hyperglycemia. Ketogenic diets are often prescribed to manage blood glucose levels. The Glucose Ketone Index (GKI) is a valuable tool for monitoring dietary adherence. This study developed a non-invasive, dual-channel 3D-microfluidic paper-based analytical device (3D-µPADs) to determine GKI from urine samples. Glucose detection employed AgNO3 as a precursor, honey as a bioreductor and capping agent, and NaOH as a base for silver nanoparticle (AgNPs) formation. Ketone detection utilized glycine in phosphate buffer pH 9.4 and sodium nitroprusside in 5% Dimethylformamide (DMF), resulting in a purple complex. Optimum conditions for glucose and ketone detection, which include concentration of reagents, reaction time, and number of reagent immobilization were assessed using image analysis. The µPADs demonstrated excellent performance with an R^2 value of 0.993, %RSD of 2.86%, and %accuracy of 99.99%. This novel 3D-µPADs-based method offers a promising approach as point of-care testing (PoCT) for GKI monitoring.

Keywords: Diabetes mellitus, Glucose ketone index, Paper-based devices, Point-of-care testing, Urine

Presenter: Akhmad Sabarudin (sabarjpn@ub.ac.id)

Nanomaterials_65

Synthesis Of Oxidized Carbon Nanotubes/C60/Ferrocene And Modification Of Its Surface By Plasma Treatment

Hafid Nur Himawan

Chemistry Study Program, Faculty of Mathematics and Natural Sciences, Sebelas Maret University.

Abstract

Modification of carbon nanotubes with other materials is interesting to study because of its wide application potential. This research aims to synthesize carbon nanotubes with C60 and ferrocene and their surface modification by plasma treatment has been successfully carried out. The synthesis process begins with oxidation with a mixture of acid solutions and the vapor phase encapsulation method. The surface modification process is carried out using plasma glow discharge (low vacuum) and plasma corona. SEM test results show different imaging of carbon nanotubes after oxidation and after modification with fullerene and ferrocene. The XRD results show peaks that match the diffraction database of graphitic carbon, Fe2O3, C60, and Ferrocene. Plasma emissions used for material surface modification are analyzed using OES spectroscopy. The results showed the presence of plasma active species of nitrogen and oxygen. Analysis of the success of surface modification was carried out by nanocomposite characterization using ATR-FTIR which showed an increasing new C=O peak with longer plasma treatment time. Furthermore, contact angle analysis of the plasma-modified material showed an increased degree of hydrophilicity of the nanocomposite surface after plasma treatment.

Keywords: carbon nanotubes, oxidation, C60, glow discharge, corona.

Presenter: Hafid Nur Himawan (avares@student.uns.ac.id)

Medicinal Chemistry_27

Co(II), Ni(II), Cu(II), and Zn(II)-(E)-N'-(2-Hydroxybenzylidene)benzohydrazide Complexes : Design, Characterization, ADME Study, and Evaluation of Antibacterial Activity

Yusuf Syahril Alam | Nuraini Fitria | Amelia Bella Putri Adama | Shava Alifia Salsabilla | Shinta Ratna Duhita | Mardi Santoso | Fahimah Martak*

Institut Teknologi Sepuluh Nopember

Abstract

Four new hydrazone complexes were successfully synthesized from Co(II), Ni(II), Cu(II), and Zn(II) metal ions with the ligand (E)-N'-(2-hydroxybenzylidene)benzohydrazide. Structural elucidation was performed using CHNSO elemental analysis, FTIR, UV-Vis, thermal analysis, and powder XRD. The FTIR spectra indicated the presence of coordination bonds in the form of M-N and M-O. The UV-Vis spectrophotometer showed LMCT transitions. TGA characterization revealed that the Co(II), Ni(II), and Cu(II) complex compounds have an M:L ratio of 1:1, whereas the Zn(II) complex compound has an M:L ratio of 1:2. These findings were corroborated by the refinement results of the experimental and standard XRD diffractogram. Accordingly, the formulas of the Co(II), Ni(II), Cu(II), and Zn(II) hydrazone complexes are [Co(L)(Cl)(H2O)], [Ni(L)(H2O)2]Cl2, [Cu(L)(H2O)]Cl, and [Zn(L)2], respectively. The ligand and complex compounds were evaluated for antibacterial activity using the disk diffusion method against Staphylococcus aureus (G+) and Escherichia coli (G-). The results show that the Cu(II) complex exhibited the largest inhibition zone compared with other samples against both bacterial strains. The ADME study revealed various pharmacological characteristics of the compounds.

Keywords: Antibacterial, Complexes, (E)-N'-(2-hydroxybenzylidene)benzohydrazide, Hydrazone, Ligand

Presenter: Yusuf Syahril Alam (7004231003@student.its.ac.id)

Medicinal Chemistry_28

Synthesis of 2,3-Dioxopyrrolidine Derivatives and Evaluation of Their Inhibitory Activity Against Ns5 Methyltransferase of Dengue Virus

Dini Aulia | Naphat Loeanurit | Aphinya Suroengrit | Siwaporn Boonyasuppayakorn | Tanatorn Khotavivattana

Center of Excellence in Natural Product Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand | Center of Excellence in Applied Medical Virology, Department of Microbiology, Faculty of Medicine, Chulalongkorn University, Bangkok, 10330, Thailand | Center of Excellence in Applied Medical Virology, Department of Microbiology, Faculty of Medicine, Chulalongkorn University, Bangkok, 10330, Thailand | Center of Excellence in Applied Medical Virology, Department of Microbiology, Faculty of Medicine, Chulalongkorn University, Bangkok, 10330, Thailand | Center of Excellence in Natural Product Chemistry, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

Abstract

Dengue virus has been recognized as a significant leading cause of viral disease globally, and no anti-dengue drug has passed clinical tests. The SAM binding site in the NS5 methyltransferase (MTase) domain presents a promising target for new drug development. Previous studies identified NSC 140047 as a potent MTase inhibitor, with a 2,3-dioxopyrrolidine moiety interacting with key residues in MTase. Building on this, we designed and synthesized novel 2,3-dioxopyrrolidine derivatives with varied substitutions to explore their potential as anti-dengue agents. 2,3-Dioxopyrrolidine derivatives were synthesized through Michael addition of tert-butyl acrylate and amine followed by refluxing with diethyl oxalate to form the 2,3-dioxopyrrolidine carboxylate as the key intermediate. Knoevenagel condensation with variations of benzaldehydes under acidic conditions yielded the novel 2,3-dioxopyrrolidine derivatives, which were characterized using 1H and 13C NMR spectroscopy. The anti-dengue activity was determined by an enzymatic assay against DENV2-MTase. Among the compounds tested, compound 2 showed the most potent activity with 95% inhibition at 50 μM. These findings indicated that the hydroxy moiety of the derivative might play an important role in their anti-dengue activity. Moreover, none of the compounds showed high toxicity to the Vero cells evaluated by the MTT assay.

Keywords: 2,3-dioxopyrrolidine derivatives, anti-dengue drug, cytotoxicity, NS5-Methyltransferase, MTase

Presenter: Dini Aulia (6572007523@student.chula.ac.th)

Medicinal Chemistry_31

In Silico and In Vitro Study of Nanoliposome Extract from *Cassia alata* Coated with Chitosan-Folate to Breast Cancer Cells

Setyanto Arief Wiedagdo | Anjelika Putri Febriyanti | Valentina Kusumaningrum | Fasha Putri Arkhani | Rizky Eka Putera | Maulidan Firdaus

Sebelas Maret University

Abstract

Development of drug delivery systems (DDS) with controlled and targeted release still needs to be developed in order to provide efficient treatment for cancer. In this research, nanoliposomes (Lip) containing *Cassia alata* extract (CA) coated with chitosan-folate (Chi-FA) have been successfully synthesized as a controlled and targeted DDS. Anticancer compounds were extracted from CA using Response Surface Methodology with optimum conditions at a solvent concentration of 70%, time 37.5 minutes and a simplicia:solvent ratio of 1:35 w/v. CA main compound, Kaempferol-3-gentiobioside (13.27%) which was then followed by molecular docking and obtained binding energy value of -8.4 kcal/mol, close to doxorubicin. The successful conjugation of Chi-FA was observed using UV-Vis. Preparation of Lip, CA loaded nanoliposomes (Lip-CA), and Chi-FA coated Lip-CA (Lip-CA@Chi-FA) was observed via FTIR and TEM. Particle size analysis confirmed the success of the coating process and met the requirements as nanoparticles (50-500 nm). Lip, Lip-CA, and Lip-CA@Chi-FA have uniform particle size distribution (PDI value <0.5) and good stability (zeta potential value > ±30 mV). Through Chi-FA coating, the encapsulation efficiency of CA in Lip increased from 94.4% to 96.7%. Drug release studies show that nanoliposome are selective against cancer cells condition with 90,62% cumulative release at 72 hours.

Keywords: Cancer, Cassia alata, Nanoliposomes, Chitosan-Folate

Presenter: Setyanto Arief Wiedagdo (setyantoarief@student.uns.ac.id)

Catalyst_92

Synthesis Of Graphitic Carbon Nitride (g-C_3N_4) Composite With CuO and NiO As A Photocatalist

Muhamad Maulana Yusuf

Diponegoro University

Abstract

Graphitic carbon nitride-based composites (g-C3N4) with CuO and NiO metal oxides were synthesized using a combined method of ultrasonication and coprecipitation. The properties of the samples were comprehensively explored using Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Scanning electron microscopy (SEM), energy-dispersive X-ray (EDS) spectroscopy. And ultraviolet-visible Diffuse Reflectance Spectroscopy (UV-DRS). The impact of metal oxide addition, and kinetic parameters on the synthesis and photocatalytic degradation processes were explored and optimized. The addition of CuO and NiO metal oxides into g-C3N4 showed a narrowing of the gap between the valence band and the conduction band, where the bandgab of g-C3N4, NiO/g-C3N4 and CuO/g-C3N4 were 2.86, 2.79, and 2.80 eV, respectively. Based on the results, g-C3N4, NiO/g-C3N4 and CuO/g-C3N4 can be used for photocatalyst process of schiff base reaction.

Keywords: Metal oxide, Schiff base, Calcination, Ultrasonication

Presenter: Muhamad Maulana Yusuf (muhamadmaulanayusuf@students.undip.ac.id)

Parallel E

Moderator: Teguh Endah S. Ph.D.

Room: 5th floor Room 2

No	Time	Name	Afiliation	Title
1	**07:30 - 07:42**	**Ismawati Palle**	**Universiti Malaysia Sabah**	**Characterization Of *Acacia mangium* Polyol-Based Polyurethane Film**
2	07:43 - 08:20	Arenst Andreas	Parahyangan Catholic University	Structural and Characterizations of Carrageenan Based Porous Carbons as Cathode's Materials for Lithium Ion Capacitors
3	07:43 - 08:20	Budi Riza Putra	IPB University	Electrochemical Sensors based on the Composite of Hydroxylated Multiwalled Carbon Nanotubes and Graphene Modified Glassy Carbon Electrode for Paraoxon-ethyl Detection
4	07:43 - 08:20	Slamet Priyono	BRIN	Analysis of the Impact of Sintering Temperature on the Properties of Lithium Manganese Nickel Oxide ($LiMn1.5Ni0.5O_4$) as a Cathode Material for Lithium-Ion Batteries
5	07:43 - 08:20	Abdulloh Rifai	BRIN	Enhanced Electrochemical Performance of Graphite Anodes for Lithium-Ion Batteries through KOH Etching
6	08:22 - 08:59	Deden Saprudin	IPB University	Magnetite Modified Carbon Paste Electrode for Silver Ion Detection with Anodic Stripping Voltammetry Technique
7	08:22 - 08:59	Annisa Nur Buana Wati	UNS	Electrocatalytic Evaluation of Fe-Co-S@rGO Composite for Oxygen Reduction Reaction in Fuel Cells
8	08:22 - 08:59	Ella Kusumastuti	ITS	Characterization of chitosan modified by graphene conjugated with magnetite particles as an electrolyte membrane (a preliminary study)
9	08:22 - 08:59	Denis Octareta Amelia Putri	UNS	Production of Screen-Printed Carbon Electrode from Coconut Shell Char

Poly_177

Characterization Of *Acacia mangium* Polyol-Based Polyurethane Film

Ismawati Palle | Naruhito Hori | Akio Takemura

Faculty of Tropical Forestry, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia | Laboratory of Adhesive Science and Bio-composites, Department of Biomaterial Sciences, The University of Tokyo | Laboratory of Adhesive Science and Bio-composites, Department of Biomaterial Sciences, The University of Tokyo

Abstract

The polyurethane films are prepared by mixing polyol with polymeric methylene diphenyl diisocyanate (pMDI) at different NCO/OH ratio. Since the PU films formation was produced at 100 ÂºC for 8 h, thus the effect of different reaction times and heating temperatures are also investigated. The properties of the PU films are then studied using the Fourier transform infrared, the thermal gravimetric analysis and the dynamic mechanical analysis. The 2D-COS analysis tools is to highlight and to disclose the correlation among functional groups especially in carboxyl region which consequently reveal the sequence motions of urethane and isocyanate derivatives formation. Clearly the formation of urethane and its derivatives was enhanced where unreacted isocyanate had reduced considerably. Interestingly, high temperature had induced the formation of urea linkages at 1640 cm-1. Furthermore, prolonging heating time significantly had enhanced the rigidity of A.mangium polyurethane films where the Tg shifted to a higher temperature. From the 2D-COS observation, the disordered hydrogen bonded carbonyl (1710 cm-1) had the most significant intensity changes with increasing NCO/OH ratio. High NCO/OH ratio significantly enhanced the hard segment formation consequently boosting the cross-linking density of A.mangium polyurethane films.

Keywords: 2D-COS analysis, cross-linking density,FT-IRs

Presenter: Ismawati Palle (isspalle@ums.edu.my)

Electrochemistry_15

Structural and Characterizations of Carrageenan Based Porous Carbons as Cathode's Materials for Lithium Ion Capacitors

Arenst Andreas

Parahyangan Catholic University

Abstract

Biopolymer based porous carbons are promising materials for the energy storage devices such as secondary battery and electrochemical supercapacitors: Especially, the development of electrochemical supercapacitors requires electrode materials possessing high surface area, high porosity, and high conductivity. One type of biopolymer is the carrageenan derived from the red seaweed. Here, we have prepared porous carbon materials originated from various types of carrageenan (kappa, iota and lambda) as electrodes for lithium-ion capacitor (LIC). Porous carbons were synthesized by hydrothermal carbonizations followed by chemical activation method using sodamide (NaNH2). The physical and morphology characterizations of porous carbons were investigated by scanning electron microscope (SEM), X-ray diffractions (XRD) and N2 adsortion/desorption. Electrochemical characterizations were done by Galvanostatic Charge Discharge and Cyclic Voltammetry (CV). Experimental results showed that the kappa carrageenan based porous carbons performed the best electrochemical performances (stable cycle and high specific capacitance) among others due to the large surface area and high content of N.

Keywords: Carrageenan; Porous Carbons; Capacitors; Hydrothermal;Cycle Performance

Presenter: Arenst Andreas (arenst@unpar.ac.id)

Electrochemical Sensors based on the Composite of Hydroxylated Multiwalled Carbon Nanotubes and Graphene Modified Glassy Carbon Electrode for Paraoxon-ethyl Detection

Wulan Tri Wahyuni | Budi Riza Putra | Elda Nurwidayanti | Munawar Khalil

Department of Chemistry, Faculty of Mathematics and Natural Sciences, IPB University | National Research and Innovation Agency (BRIN) | Department of Chemistry, Faculty of Mathematics and Natural Sciences, IPB University | Department of Chemistry, Faculty of Mathematics and Natural Sciences, University of Indonesia

Abstract

Herein, a nonenzymatic detection of paraoxon-ethyl was developed by modifying a glassy carbon electrode (GCE) with the composite of hydroxylated multi-walled carbon nanotubes (MWCNT-OH) and graphene. This composite was then characterized using FTIR, Raman spectroscopy, FESEM-EDS, and high-resolution TEM techniques along with the electrochemical characterization using cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) techniques. The proposed sensor for paraoxon-ethyl detection based on MWCNT-OH/graphene-modified GCE demonstrates good electrochemical and electroanalytical performance with the linear range of concentrations from 0.2 to 100 μM with a limit of detection of 10 nM and superior sensitivity of 19.11 μA μM–1 cm–2. It was found that the synergistic effect between MWCNT-OH and graphene provides a higher conductivity and enhanced electrocatalytic activity for paraoxon-ethyl detection at pH 7. In addition, the proposed sensor for paraoxon-ethyl confirmed good reproducibility, with the possibility of being further developed as a disposable electrode. This sensor also displayed good selectivity in the presence of several potential interfering species such as diazinon, carbaryl, ascorbic acid, glucose, nitrite, and FeSO4 along its application in real fruit samples. In conclusion, this proposed sensor might have a potential to be developed as a platform of electrochemical sensors for pesticide detection.

Keywords: pesticide, sensor, paraoxon-ethyl, graphene, voltammetry

Presenter: Budi Riza Putra (budiriza@gmail.com)

Electrochemistry_23

Analysis of the Impact of Sintering Temperature on the Properties of Lithium Manganese Nickel Oxide (LiMn1.5Ni0.5O4) as a Cathode Material for Lithium-Ion Batteries

Slamet Priyono

National Research and Innovation Agency, South Tangerang 15310, Indonesia

Abstract

The cathode material LiMn1.5Ni0.5O4 was synthesized using the solid-state method, with sintering temperatures varied at 500°C, 600°C, 700°C, and 800°C. The synthesis involved grinding and heating the material at these temperatures for 4 hours. Characterization was performed using X-Ray Diffraction (XRD), Field Emission Scanning Electron Microscopy (FE-SEM), Electrochemical Impedance Spectroscopy (EIS), Cyclic Voltammetry (CV), and Charge-Discharge (CD) tests. XRD analysis revealed several phases in the material, including Lithium Manganese Oxide (LMO), Manganese Oxide (MnO_2), and Nickel Oxide (NiO). FE-SEM data indicated that at 800°C, the granules disappeared, resulting in denser, finer, and more uniform particles. Electrochemical characterization showed that at 800°C, the material had a low ionic resistance of 142.5 Ω and a specific capacity of 146 mAh/g. This study demonstrates the successful synthesis of LiMn1.5Ni0.5O4 using the solid-state method, highlighting that an 800°C sintering temperature optimizes electrochemical performance.

Keywords: Cathode, LiMn1,5Ni0,5O4, Solid-State Sintering

Presenter: slamet priyono (slam021@brin.go.id)

Electrochemistry_57

Enhanced Electrochemical Performance of Graphite Anodes for Lithium-Ion Batteries through KOH Etching

Abdulloh Rifai

Research Center for Advanced Materials, BRIN

Abstract

The rising market demand for electric vehicles (EVs) as eco-friendly alternatives to fossil fuel-powered cars has positioned lithium-ion batteries (LIBs) as crucial components of EV mobility. Within this context, graphite stands out as a leading anode material due to its favorable properties; however, its limitations in fast-charging scenarios necessitate further improvement. This research explores the enhancement of graphite's electrochemical performance through base etching using varying concentrations of potassium hydroxide (KOH). Structural analyses via X-ray diffraction indicate an increase in interlayer spacing after etching, while field-emission scanning electron microscopy reveals the formation of surface pores in the graphite, and the surface area of KOH-etched graphite using the Brunauer-Emmett-Teller analysis is higher than that of unmodified graphite. Electrochemical evaluations show that KOH-etched graphite, especially at a concentration of 1.25 M, demonstrates higher lithium-ion diffusion coefficients and specific capacities. The KOH-etched graphite (KG 1.25) achieves an initial discharge capacity of 543.9 mAh g-1, with subsequent cycle capacities of 389.2 mAh g-1 (0.1C), 346.8 mAh g-1 (1C), and 282.4 mAh g-1 (2C). The morphological changes improve electrolyte penetration and lithium-ion storage, thereby significantly enhancing battery performance. This study highlights the potential of KOH-etched graphite as a promising solution for fast-charging applications in LIBs.

Keywords: graphite, anode, fast-charging, KOH etching, lithium-ion battery

Presenter: Abdulloh Rifai (abdu058@brin.go.id)

Magnetite Modified Carbon Paste Electrode for Silver Ion Detection with Anodic Stripping Voltammetry Technique

Deden Saprudin | Firda Rizky | Budi Riza Putra | Wulan Tri Wahyuni

IPB University | IPB University | BRIN | IPB University

Abstract

Silver (Ag) is a precious metal frequently used in medical applications due to its antimicrobial properties. However, excessive use of silver can be toxic to living organisms, thus accurate determination of silver levels is essential. This research investigates the effectiveness of a carbon paste electrode (EPK) modified with magnetite nanoparticles (Fe_3O_4) for detection of silver ions using anodic stripping voltammetry. The Fe_3O_4 nanoparticles were synthesized via co-precipitation methods, and X-ray diffraction (XRD) confirmed its successful synthesis. The results indicate that the EPK/Fe_3O_4 electrode, with a graphite-to-Fe_3O_4 ratio of 95:5 (w/w), provides the highest electrochemical response for silver ion detection. Optimum conditions for detecting silver ions were achieved using a 0.1 M KNO_3 electrolyte solution at pH 7, with a deposition potential of -0.1 V vs. Ag/AgCl and a deposition time of 60 seconds. The EPK/Fe_3O_4 electrode can detect silver ions with a linear response in the concentration range of 1–250 µM, featuring a sensitivity of 0.3441 µA μM^{-1}, a detection limit of 0.05 µM, and a quantitation limit of 0.5 µM. The electrode exhibits good reproducibility and stability in detecting silver ions, with a relative standard deviation (RSD) value of less than 5%.

Keywords: carbon paste electrode, electrochemical sensor, co-precipitation, magnetite, silver ion

Presenter: Deden Saprudin (dsp@apps.ipb.ac.id)

Electrochemistry_141

Electrocatalytic Evaluation of Manganese-Bis(Terpyridine) Coordination Polymer for Oxygen Reduction Reactions in Fuel Cells

Annisa Nur Buana Wati[1], Santiago Gómez-Ruiz[2], Atmanto Heru Wibowo[1*]

[1]Department of Chemistry, Faculty of Mathematics and Sciences, Universitas Sebelas Maret, Indonesia
[2]Department of Biology and Geology, Physics and Inorganic Chemistry, Universidad Rey Juan Carlos, Spain
[*]Corresponding author. Email address: aheruwibowo@staff.uns.ac.id
Presenter email address: c_anbw@student.uns.ac.id

Abstract.

This research was carried out to investigate the electrocatalytic performance of Mn-bis(terpyridine) as a replacement for platinum in the oxygen reduction reaction in fuel cells. Coordination polymer of manganese with hexadentate chelating ligand bis(terpyridine) (Mn-btpy) has shown a capability in reducing oxygen in the alkaline media. A rotating ring-disk electrode (RRDE) measurements using a bipotentiostat were carried out at a potential range of 1 to 0 V vs RHE (E_{ring} = 1.2 V vs RHE) with scanning speed of 10 mV/s and variation of rotation rate (200, 400, 900, 1600 and 2500 rpm). The electrocatalytic performance of the materials showed great performance with the onset potential value of 0.83 V vs RHE and the highest electron transfer value of 3.92. The oxygen reduction mechanism followed a four-electron pathway mechanism where O_2 directly reduced to H_2O.

Keywords: terpyridine; coordination polymers; reduced graphene oxide; electrocatalyst; oxygen reduction reaction

Presenter: Annisa Nur Buana Wati (c_anbw@student.uns.ac.id)

Materials Chemistry_132

Characterization of chitosan modified by graphene conjugated with magnetite particles as an electrolyte membrane (a preliminary study)

Ella Kusumastuti | Lukman Atmaja | Mardi Santoso | Hamzah Fansuri

Chemistry Department, Faculty of Science and Data Analytics, Institut Teknologi Sepuluh Nopember

Abstract

Chitosan properties improvement as primary based for electrolyte membranes was conducted by unique conversion procedure to produced composite materials using graphene as fillers. Prior to fully functions, the graphene conjugated in situ with magnetite. Material and functional characterizations of the membrane has been carried out to includes functional groups analysis (FT-IR), morphology assesment (SEM), measurement of tensile strength, water absorption, and oxidation resistance using the Fenton test, as well as ion exchange capacity. Membrane performance tests were carried out by measuring proton conductivity and methanol permeability. The results show that the composites give significant increase in proton conductivity and oxidation stability while decreasing the methanol permeability of the membrane. The chitosan/graphene-magnetite membrane achieved proton conductivity (25°C) of 5.960×10-3 S/cm which much greater than the pure chitosan membrane which was only 1.519×10-8 S/cm. The oxidation stability for 2 hours increase from 22.12% in pure chitosan to 82.69% in chitosan/graphene-magnetite. The methanol permeability of the membrane in chitosan/graphene-magnetite decrease drastically from 8.41×10-5 to 2.88 ×10-5 cm2/s. This preliminary research is important in the development of chitosan membranes as a solid electrolyte of the Direct Methanol Fuel Cell system.

Keywords: chitosan membrane, graphene conjugated with magnetite, electrolyte membrane, proton conductivity, methanol permeability

Presenter: Ella Kusumastuti (7004221005@student.its.ac.id)

Electro_150

Production of Screen-Printed Carbon Electrode from Coconut Shell Char

Nabila Putri Aulia, Denis Octareta Amelia Putri, Fitria Rahmawati

Research Group of Solid-State Chemistry and Catalyst, Chemistry Department, Sebelas Maret University, Indonesia, Research Group of Solid-State Chemistry and Catalyst, Chemistry Department, Sebelas Maret University, Indonesia, Research Group of Solid-State Chemistry and Catalyst, Chemistry Department, Sebelas Maret University, Indonesia

Abstract

In our previous research, a screen printing carbon electrode, SPCE, from coconut shell char has succesfully developed through a single manual printing technique. This research is a continuation of the previous one aimed to produce large quantities of SPCE by a vacuum casting machine. Some variables were studied including the casting speed (mm/s), the dispersant volume (mL), the film thickness (mm), and the type of sticker material for the SPCE template. Two kinds of sticker material used for template printing, i.e., a waterproof paper and a waterproof plastic sticker. Meanwhile, a various NMP dispersant applied were 3.00; 3.75; and 4.50 mL. Two casting speed applied were 17.5 mm/s, and 35 mm/s. The film thickness applied were 0.5 mm, 0.65 mm, 0.75 mm, and 1.00 mm. The SPCE produced was analyzed by digital microscope to investigate the quality of the carbon film, including compactness of the film and the presence of cracks. The produced SPCE was tested by using the SPCE as electrode in cyclic voltammetry analysis for Pb(II).

Keywords: carbon, coconut shell, screen printed electrode, voltammetrys

Presenter: Denis Octareta Amelia Putri (denisoctaretha10@gmail.com)

Parallel F

Moderator: Dr. Dian M Wodjonarko

Room: 8 th floor meeting room

No	Time	Name	Afiliation	Title
1	**07:30 - 07:42**	**Sabiha Hanim Saleh**	**UMS**	**Development and Characteristics of a Hemicellulose based Film Derived from Rice Straw**
2	07:43 - 08:20	Yusnadia Kemala Wati	UNS	Degradation of Indigo Carmine by Fenton and Photo-Fenton Processes Using UiO-66 Modified with Fe_3O_4 Nanoparticles as Catalyst
3	07:43 - 08:20	Dwi Nanda Mulya	UNDIP	Synthesis, Characterization, and Antioxidant Potential of Nickel (II) Complexes with derivatives of salen
4	07:43 - 08:20	Ira Dwi Lestari	UNS	Photodegradation of Methylene Blue Using Nickel and Lanthanum Co-Doped Strontium Titanate Under Ultraviolet Light Irradiation
5	07:43 - 08:20	Agus Solehudin	UPI	Performance Of ZnAl And TiCN Alloys Coated On Tool Steel For Drill Bit Applications In Chloride Environments
6	08:22 - 08:59	Ridwan Adam Muhamad Noor	UPI	Study of Hot Dip Aluminum-Zinc Alloy Coating on Sheet Steel for Vehicle Body Applications in Tropical Regions
7	08:22 - 08:59	Damar Nurwahyu Bima	UNDIP	Examining the Impact of Hydroxyl Group Position on Antibacterial Activity of Copper Complexes Derived from Vanillin-Based Schiff Bases: Experimental and Computational Analysis
8	08:22 - 08:59	Dendy	UNS	Efficient Adsorption of Indigo Carmine Employing Ethylenediamine-customized Materials of Institute Lavoisier (MIL)-101(Cr) and -101(Cr)-NH_2

Development and Characteristics of a Hemicellulose based Film Derived from Rice Straw

Nur Hazlilla Zulyadi[1], Noraini Hamzah[1,2], Shariff Che Ibrahim[1,2], Sabiha Hanim Saleh[1,2*]

[1]Department of Chemistry and Environment, Faculty of Applied Sciences, Universiti Teknologi MARA,40450 Shah Alam, Selangor, Malaysia

[2]Industrial Waste Conversion Technology Research Group, Faculty of Applied Sciences, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

[*]Corresponding author: sabihahanim@salam.uitm.edu.my

Abstract

Hemicellulose-based films, derived from lignocellulosic agricultural waste like rapeseed straw, rice straw, sugarcane bagasse, and oil palm residues, have garnered significant attention for their potential in sustainable food packaging solutions. These films are environmentally friendly, biodegradable, and can be produced from renewable resources, making them an attractive alternative to conventional plastic packaging. Despite their promising attributes, a major limitation of hemicellulose-based films is their inherent hydrophilicity, which leads to poor water barrier properties. This limitation restricts their effectiveness in packaging applications where moisture resistance is crucial. This study investigates the influence of varying concentrations of citric acid (CA) (5%, 10%, 20%, and 30% w/w based on hemicellulose content) on the properties of hemicellulose-based films. The research focuses on key characteristics such as film thickness, surface color, water vapor permeability (WVP), water vapor transfer rate (WVTR), thermal stability, solubility, moisture content, and tensile strength. These properties are critical in determining the suitability of the films for specific packaging applications. The results indicate that the incorporation of citric acid significantly affects the water barrier properties of the films. Specifically, the addition of CA leads to an increase in both WVP and WVTR. The highest values were recorded for the film containing 10% citric acid (HCA10), with WVP reaching 26.25 g m−2 s−1 and WVTR at 10.15 x10−5 g m−1 Pa−1 s−1. These findings suggest that while the hydrophilicity of the films increases with CA content, making them less effective as moisture barriers, they might still be highly suitable for packaging applications where moisture permeability is desirable, such as for fruits and vegetables. The increased flexibility and potential antimicrobial properties conferred by citric acid further enhance the appeal of these films in specific food packaging contexts, offering a balance between environmental sustainability and functional performance.

Keywords: hemicellulose film, rice straw, citric acid

Catalyst_33

Degradation of Indigo Carmine by Fenton and Photo-Fenton Processes Using UiO-66 Modified with Fe_3O_4 Nanoparticles as Catalyst

Yusnadia Kemala Wati, Witri Wahyu Lestari, Abu Masykur, Teguh Endah Saraswati, Edi Pramono, Fajar Rakhman Wibowo, Sentot Budi Rahardjo

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret

Abstract

Advanced Oxidation Processes (AOPs), including the Fenton and photo-Fenton processes, are promising methods for degrading dye substances. This study investigates the influence of adding Fe_3O_4 to the characteristics of UiO-66 material support and its performance in the degradation of indigo carmine using Fenton and photo-Fenton processes. The Fe_3O_4/UiO-66 composite was synthesized via an ex-situ modification approach with Fe3O4 concentrations of 3% and 10% (w/w). The synthesized material was characterized using X-Ray Diffraction (XRD) and Fourier Transform Infrared (FTIR) spectroscopy, revealing diffraction patterns and absorption bands characteristic of both Fe_3O_4 and UiO-66. Field Emission Scanning Electron Microscopy-Energy Dispersive X-Ray (FESEM-EDX) and Transmission Electron Microscopy (TEM) analyses showed a core-shell morphology for the composite without altering the original UiO-66 structure. Nitrogen adsorption isotherm data classified the materials as micro-mesoporous, with a decrease in surface area and pore size following the addition of Fe3O4. Thermogravimetric Analysis (TGA) indicated that the addition of Fe3O4 increased thermal stability and residue formation. Characterization using a Vibrating Sample Magnetometer (VSM) showed a decrease in magnetization for the Fe_3O_4/UiO-66 composite compared to Fe_3O_4 nanoparticles. Degradation studies of indigo carmine at pH 1 demonstrated that the 10% Fe3O4/UiO-66 composite exhibited the highest performance, achieving degradation efficiencies of 96.74% with the Fenton process and 98.23% with the photo-Fenton process.

Keywords: Fe_3O_4/UiO-66, Fenton, photo-Fenton, indigo carmine, degradation

Presenter: Yusnadia Kemala Wati (yusnadiaakw@student.uns.ac.id)

Synthesis, Characterization, and Antioxidant Potential of Nickel (II) Complexes with derivatives of salen

Dwi Nanda Mulya

Diponegoro University

Abstract

We explored the synthesis and characterization of nickel (Ni) complex compounds with salen-derived ligands, and assessed their potential antioxidant activity. Salen-derived ligands were synthesized through condensation between o-vanillin and ethylenediamine. NiSalen complex compound was then synthesized by reacting nickel(II) acetate solution to the ligand. Characterization was carried out by various analytical methods. FTIR spectra showed the presence of a characteristic band. NMR analysis provided information on the chemical environment of protons and carbons on the ligand, confirming its molecular structure. UV-Vis spectra showed the presence of characteristic absorption bands indicating the presence of electronic transitions in the complex compound. Conductometry was used to determine the conductive properties of the compound, indicating that it is not an ion. Magnetic susceptibility balance (MSB) provided information on the nickel bilox and the geometry of the complex compound which is square planar. This study provides insight into the characteristics and potential applications of Ni complex compounds with salen-derived ligands as antioxidant agents, which could have implications in the development of active ingredients for health and industrial applications.

Keywords: Nickel (II) salen complexes, salen synthesis, antioxidant activity

Presenter: Dwi Nanda Mulya (dwinandamulya@students.undip.ac.id)

Catalyst_127

Photodegradation of Methylene Blue Using Nickel and Lanthanum Co-Doped Strontium Titanate Under Ultraviolet Light Irradiation

Ira Dwi Lestari

Universitas Sebelas Maret

Abstract

Degradation of methylene blue wastewater dye using strontium titanate semiconductor photocatalyst produces high efficiency and is environmentally friendly. In this study, the strontium titanate semiconductor was co-doped with nickel (x=0.04) and lanthanum (y=0.04) variations to determine the effect of nickel and lanthanum doping in degrading methylene blue dye. The synthesis of STO-NixLay (x=0.04 and y=0.04) material was carried out using the coprecipitation method with a sintering temperature of 1000°C for 4 hours. Crystal size, surface area, and particle size showed concordant results. Strontium titanate absorption peaks were formed without the presence of nickel and lanthanum absorption peaks, indicating that doping can be integrated into strontium titanate. The band gap size decreased with the addition of nickel and lanthanum doping. Photocatalyst activity was observed through the degradation of methylene blue under ultraviolet light irradiation for 1 – 5 hours. The percent degradation increased with the duration of irradiation. The addition of nickel and lanthanum doping to Strontium titanate showed a higher percent degradation than the addition of single nickel or lanthanum doping. The highest percent degradation was obtained by the STO-Ni0.04La0.04 sample with irradiation for 5 hours at 87.11%.

Keywords: Strontium Titanate, Nickel, Lanthanum, Methylene Blue, and Photodegradations.

Presenter: Ira Dwi Lestari (dwilestari00262@student.uns.ac.id)

Performance Of ZnAl And TiCN Alloys Coated On Tool Steel For Drill Bit Applications In Chloride Environments

Agus Solehudin*[1], Haipan Salam[2], Enda Permana[3], Asep S Fariz[4]

[1,2]Study Program of Chemical Engineering, Universitas Pendidikan Indonesia
[3]Study Program of Mechanical Engineering Education, Universitas Pendidikan Indonesia
[4]Indonesia PVD Coating, PT Samudra Teknindo Hydraumatic
Correspondent E-mail: asolehudin@upi.edu

ABSTRACT

This study aims to determine the characteristics of mild steel coated Zn and ZnAl and tool steel coated TiCN with hardness test, thickness test and corrosion test in chloride environment. The study was conducted on three types of specimens, namely mild steel coated Zn, coated ZnAl and tool steel coated TiCN. Specimen surface preparation refers to ASTM G1. Hardness test for mild steel coated Zn and coated FeAl specimens using Zwick Machine, while tool steel coated TiCN specimens using Fischerscope HM-2000S. Thickness test for mild steel coated Zn and coated FeAl specimens using dualscope® MPOR instrument, while tool steel coated TiCN specimens using Fischerscope X-ray Xan. Corrosion test was conducted by immersion method referring to AST ASTM G3. The results of the study showed (i) The average hardness of mild steel and tool steel increased after being coated; (ii) The average hardness of tool steel after being coated with TiCN increased very high with increasing PVD process time; (iv) The average thickness of mild steel coated with Zn is thicker than mild steel coated with ZnAl. While the thickness of tool steel coated with TiCN is lower than mild steel coated with Zn and ZnAl. However, with increasing PVD process time, the average thickness of TiCN increases; (v) the corrosion rate of mild steel coated with ZnAl specimens is lower than mild steel coated with Zn. This indicates that the strength of ZnAl forms a passive layer of Al2O3 on the surface of the specimen; (vi) The results of the study show that tool steel coated with TiCN can be recommended for drill bit applications. Keywords: tool steel; corrosion; hardness; Zn-Al alloy; TiCN

Presenter: Agus Solehudin (asolehudin@upi.edu)

Study of Hot Dip Aluminum-Zinc Alloy Coating on Sheet Steel for Vehicle Body Applications in Tropical Regions

Ridwan Adam Muhamad Noor | Agus Solehudin | Ramdhani

Study Program of Automotive Engineering Education, Universitas Pendidikan Indonesia | Study Program of Chemical Engineering, Universitas Pendidikan Indonesia. | Study Program of Automotive Engineering Education, Universitas Pendidikan Indonesia

Abstract

The development of coatings is a solution to prevent damage to vehicle bodies, namely by increasing the characteristics of layers that have good adhesion, hardness and environmental resistance. This research aims to study the characteristics of hot dip aluminum-zinc alloy layers on steel sheets with variations in layer thickness. The research method consists of testing the characteristics of the coating results which include hardness, corrosion testing and microscopic examination. Specimen surface preparation refers to ASTM G1. Testing for layer thickness refers to ASTM E407. Testing for surface hardness refers to ASTME92. Meanwhile, corrosion tests are carried out using salt spray and immersion methods which refer to ASTM B117 and ASTM G3. The research results show that the thickness of the aluminum-zinc alloy layer is 100 and 70 µm. The surface hardness of aluminum-zinc alloy types 100 and 70 layers is 138.5 and 116.8 HV. Corrosion test results show that the type 100 aluminum-zinc alloy layer is more resistant than type 70. This is because the type 100 and 70 aluminum-zinc alloy layers, when in contact with a corrosive environment, Al2O4Zn and Al2O3 corrosion product compounds are formed. The Al2O4Zn compound is a passive layer, and the Al2O3 compound is a protective passive. Both specimens show excellent corrosion resistance and a predicted service life of over 10 years in critical corrosive environments, so they can be used for vehicle bodies.

Keywords: sheet steel; corrosion; violence; Al-Zn alloy; coating

Presenter: Ridwan Adam Muhamad Noor (adam@upi.edu)

Examining the Impact of Hydroxyl Group Position on Antibacterial Activity of Copper Complexes Derived from Vanillin-Based Schiff Bases: Experimental and Computational Analysis

Damar Nurwahyu Bima

Diponegoro University

Abstract

The positioning of the hydroxyl group plays a crucial role in both the coordination of Schiff bases with copper ions and their antibacterial effectiveness. By utilizing ortho-vanillin and para-vanillin as precursors, we successfully synthesized Schiff bases HL1 (ortho) and L2 (para), which were confirmed through Fourier Transform Infrared (FT-IR) and Nuclear Magnetic Resonance (NMR) analyses. HL1 forms the CuL1 complex as a bidentate ligand with N, O donor atoms, while L2 only provides a single N donor atom, forming the CuL2 complex but retaining a free hydroxyl group. Crystallographic analysis revealed a tetragonal crystal system for the Schiff base and orthorhombic for the complex. Electronic transition analysis supported by Density Functional Theory (DFT) studies indicated a distorted square plane geometry for the CuL1 and CuL2 complexes. The in vitro antibacterial assessment against E. coli and S. aureus revealed that the CuL1 and CuL2 complexes exhibited significantly better activity than Schiff bases HL1 and L2. Moreover, the comparison of antibacterial activity between CuL1 and CuL2 against both bacteria indicated that CuL2 demonstrated superior bioactivity. This difference could be attributed to the presence of a free hydroxyl group, supported by computational analysis.

Keywords: Schiff base, Hydroxyl group, Position isomer, Complex, Antibacterial

Presenter: Damar Nurwahyu Bima (damarnurwahyubima@lecturer.undip.ac.id)

Materials Chemistry_51

Efficient Adsorption of Indigo Carmine Employing Ethylenediamine-customized Materials of Institute Lavoisier (MIL)-101(Cr) and -101(Cr)-NH2

Dendy Dendy | Witri Wahyu Lestari | Isa Anshori | Akhmadi Surawijaya | Murni Handayani | Sayekti Wahyuningsih | Teguh Endah Saraswati | Rujito Sesariojiwandono Ridho Suharbiansah

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Jl. Ir. Sutami No. 36 A Kentingan, Jebres, Surakarta, 57126, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Jl. Ir. Sutami No. 36 A Kentingan, Jebres, Surakarta, 57126, Indonesia | Research Center for Nanosciences and Nanotechnology (RCNN) Bandung Institute of Technology, Bandung, Indonesia | Electronic Research Group, Electrical Engineering Department, Bandung Institute of Technology, Bandung, Indonesia | Research Center for Advanced Materials - National Research and Innovation Agency (BRIN), Puspitek Area, Tangerang Selatan, Banten, 15314, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Jl. Ir. Sutami No. 36 A Kentingan, Jebres, Surakarta, 57126, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Jl. Ir. Sutami No. 36 A Kentingan, Jebres, Surakarta, 57126, Indonesia | Institute of Chemical Technology, Universität Leipzig, Linnéstr. 3, 04103 Leipzig, Germany

Abstract

The responsible disposal of dye waste is crucial for the preservation of the environment. As part of efforts to address this critical environmental issue, this research investigated Metal-Organic Frameworks (MOFs) as potential adsorbents for a dye known as indigo carmine (IC). The study meticulously compared and analyzed different types of MOFs, MIL-101(Cr), EDA@MIL-101(Cr), and MIL-101(Cr)-NH2, to ascertain their adsorption capabilities, behavior during the adsorption process and the influence of amine groups produced from ethylenediamine (EDA) attached on the structure of MIL-101(Cr) and the linker source in MIL-101(Cr)-NH2 was investigated. The materials were prepared in hydrothermal conditions and modified using the double solvent method with EDA at ambient temperature for 30 minutes. The synthesis and modification were validated through XRD, FTIR, and nitrogen sorption analyses. The research revealed that the optimal conditions for IC adsorption were observed at a pH level of 2 with a contact time of 60 minutes. The results demonstrated that all three types of MOFs exhibited the ability to effectively adsorp IC, displaying similar maximum adsorption capacities. However, the study found that the presence of the amine group in EDA@MIL-101(Cr) did not significantly impact the increase in adsorption capacity, suggesting that physical rather than chemical factors primarily drove the adsorption process. The adsorption isotherm model matches the Freundlich model, which affirms that the adsorption process arises physically. This finding underscores the continued critical importance of porosity in the adsorption mechanism. The findings strongly indicate that all three MOFs could serve as effective absorbers of IC.

Keywords: adsorption, amine-modified, indigo carmine, MIL-101(Cr), MIL-101(Cr)-NH2

Presenter: Dendy (dendydendy@student.uns.ac.id)

Parallel G

Moderator: Prof. Dr. Triana Kusumaningsih

Room: 3rd floor ballroom

No	Time	Name	Afiliation	Title
1	07:30 - 07:40	Amirza Fahma Addiniyyah	UNS	Synthesis of ZnO/NCQD by Hydrothermal Method as Photocatalyst Materials for Myclobutanil Pesticide Degradation
2	07:40 - 07:50	Sri Mulijani	IPB University	Synthesis Heterogenous Catalyst based on Green Algae Ulva lactuca for Biodiesel Production
3	07:50 - 08:00	Lina Widya Puspitaningrum	UNS	Synthesis And Characterization Of Cu/ZnO Catalysts Supported By Activated Carbon From Palm Shells
4	08:00 - 08:10	Adi Darmawan	UNDIP	Thin-Film Nanofiltration Membrane with Polyaniline-Decorated Graphene Oxide through In-Situ Interfacial Polymerization for Ion Separation
5	08:10 - 08:20	Mardiana	UNS	Catalytic Hydrodeoxygenation In Biogasoline Production With Zeolite-Based Support
6	08:20 - 08:30	Muhammad Yudhistira Azis	ITB	The Potency of a Diatom Cyclotella striata strain TBI to Decrease Fe(III) Ion Content in Culture Media
7	08:30 - 08:40	Sekar Ayu Farida Ali	UNDIP	Computational Study of the Stability of Vitamin C on the Effect of Solvent and Temperature Compared with Experimental Results

Catalyst_178

Synthesis of ZnO/NCQD by Hydrothermal Method as Photocatalyst Materials for Myclobutanil Pesticide Degradation

Amirza Fahma Addiniyyah | Kusumandari | Osi Arutanti | Yayuk Astuti | Hendri Widiyandari

Department of Physics, Faculty of Mathematics and Natural Science, Sebelas Maret University, Jl. Ir. Sutami 36A Surakarta | Department of Physics, Faculty of Mathematics and Natural Science, Sebelas Maret University, Jl. Ir. Sutami 36A Surakarta | Research Center for Advanced Chemistry, National Research and Innovation Agency, Tangerang, Selatan, Banten, 15314, Indonesia | Department of Chemistry, Universitas Diponegoro, Jl. Prof. Soedharto, S.H. Tembalang, Semarang 50275, Indonesia | Department of Physics, Faculty of Mathematics and Natural Science, Sebelas Maret University, Jl. Ir. Sutami 36A Surakarta

Abstract

The accumulation of myclobutanil can harm aquatic life. This problem can be solved with photocatalyst. A potential photocatalyst material is ZnO/NCQDs. In this study synthesized ZnO/NCQDs by hydrothermal method with temperature variations of 100Â°C, 120Â°C, 140Â°C, and 160Â°C. XRD, SEM-EDX, PL, and UV-Vis DRS characterization were performed on ZnO/NCQDs. ZnO/NCQDs crystal structure is hexagonal (wurtzite) and has nanoflowers morphology, where the increase in temperature variation causes more petals growth. 395 nm excitation PL test PL excitation-395 nm test shows that the higher the temperature variation causes a decrease in emission intensity, so that the recombination is getting lower. The ZnO/NCQDs variation has a bandgap energy with a range of (3.166-3.207) eV, where the bandgap energy higher as the temperature varies. Myclobutanil solution was degraded at 48.42% for 2 hours and it was optimally produced by the ZnO-NCQDs-140 variation. ZnO-NCQDs-140 has a particle size of 729 nm, crystal size of 5.8 nm, and the lowest recombination energy, its band gap energy of 3.185 eV, and reaction rate of 0.00552 min-1.

Keywords: Hydrothermal, Myclobutanil, Quantum Dots, Photocatalyst, ZnOs

Presenter: Amirza Fahma Addiniyyah (amirzafahmaa@gmail.com)

Catalyst_156

Synthesis Heterogenous Catalyst based on Green Algae Ulva lactuca for Biodiesel Production

Sri Mulijani

IPB University Bogor

Abstract

Heterogeneous catalysts in the transesterification reaction of used cooking oil into biodiesel have been investigated extensively. One of the potential sources of heterogeneous catalysts is green algae Ulva lactuca. This study purposes to determine the potential, characteristics of heterogeneous catalysts, the influence calcination temperature, concentrations, and transesterification temperatures on the quality of biodiesel produced. The results showed that the variation in calcination temperature greatly affected the morphology of the aggregate, the content of potassium oxide and potassium carbonate as a source of bases, as well as the size of the pores. The surface area of the catalyst ranges from 662.228−160.916 m2/g. The variations made do not affect the density value but affect the acid value. The optimal conditions for the transesterification reaction using a catalyst calcination temperature of 550 °C, a catalyst concentration of 2%, and a transesterification temperature of 70 °C obtained a methyl ester yield of 50.07%.

Keywords: heterogenous catalyst, biodiesel, green alga, calcination, morphologys

Presenter: Sri Mulijani (srimulijani@apps.ipb.ac.id)

Catalyst_160

Synthesis And Characterization Of Cu/ZnO Catalysts Supported By Activated Carbon From Palm Shells

Lina Widya Puspitaningrum, Fusia Mirda Yanti, Khoirina Dwi Nugrahaningtyas,

UNS, BRIN, UNS

Abstract

Palm shell waste in Indonesia is abundant but has not been optimally utilized. The research involves the synthesis of activated carbon through a carbonization process at a temperature of 550°C for 3 hours, followed by an activation process using 20% ZnCl2 solution, 5% K2CO3, and/or microwave waves. The resulting activated carbon is referred to as ACZ, ACK, ACZ Mw, and ACK Mw. The next step is the impregnation of Cu and Zn metals on activated carbon at a ratio of 10/10/80. The Cu/ZnO/AC catalyst is used in the conversion of CO to methanol. The catalysts produced are referred to as Cu/ZnO/ACZ, Cu/ZnO/ACK, Cu/ZnO/ACZ Mw, and Cu/ZnO/ACK Mw. The catalysts are characterized using XRD, SAA, XRF, and SEM-EDX. Catalyst activity tests are conducted using a microactivity PID reactor with a feed gas flow rate of CO and H2 at a ratio of 1:2 at 240°C and 12 bar pressure for 1 hour. The products are analyzed using GC-TCD to observe the reduction in CO area. The results show that the activated carbon has an amorphous carbon structure, while the Cu/ZnO/AC catalyst indicates the presence of CuO with a monoclinic structure and ZnO with a hexagonal wurtzite structure. The highest surface area is observed in ACK, which has mesopore-type pores. Metal impregnation causes a decrease in surface area due to metal aggregation. The catalyst activity tests show that the highest catalytic activity, based on the greatest reduction in CO, is achieved using the Cu/ZnO/ACK catalyst.

Keywords: Palm Shell, Activated Carbon, Cu/ZnO/AC Catalyst, Characterizations

Presenter: Lina Widya Puspitaningrum (linawidya8@student.uns.ac.id)

Materials Chemistry_136

Thin-Film Nanofiltration Membrane with Polyaniline-Decorated Graphene Oxide through In-Situ Interfacial Polymerization for Ion Separation

Adi Darmawan | Hasan Muhtar | Desi Nur Pratiwi

Diponegoro University | Diponegoro University | Diponegoro University

Abstract

Graphene oxide (GO) and polyaniline (PANI) ion separation membranes have been successfully created using the in-situ interfacial polymerization technique. Different forms of PANI, such as emeraldine base (EB PANI), emeraldine salt (ES PANI), and pernigraniline base (PB PANI), were incorporated into the GO matrix and evaluated. The addition of PANI species led to increased interlayer spacing, improved positive surface charge, and greater hydrophobicity of the membranes. Furthermore, the incorporation of PANI enhanced the mechanical stability and durability of the membranes under various pH conditions. The ion separation capabilities of the membranes were tested with feed ions like Na+, Li+, Mg2+, and Al3+. Among them, the GO-ES PANI membrane showed the highest separation efficiency for Na+/Al3+ ions, achieving an ideal selectivity of 76.23 ± 1.25. In contrast, ions with similar sizes and charges exhibited lower selectivity. Additionally, the GO-ES PANI membrane demonstrated superior performance stability, maintaining consistent selectivity for up to 20 hours. These findings suggest that the GO-ES PANI membrane offers the best ion separation performance and is ideal for practical use.

Keywords: Polyaniline; In-Situ Interfacial Polymerization; Ion separation; Charge Regulations; Donnan effect

Presenter: Adi Darmawan (adidarmawan@live.undip.ac.id)

Catalyst_169

Catalytic Hydrodeoxygenation In Biogasoline Production With Zeolite-Based Support

Mardiana, Taufiq Yap Yun Hin, Khoirina Dwi Nugrahaningtyas

Universitas Sebelas Maret, Universiti Putra Malaysia, Universitas Sebelas Maret

Abstract

Biogasoline as a sustainable fuel is generally produced from the pyrolysis reaction of biomass under certain conditions. However, biomass pyrolysis products cannot be used directly as fuel due to the high content of oxygenated compounds. Oxygenated compounds may reduce the quality of biofuel due to low heating rate, high viscosity, and corrosivity to the engine. Improving biofuel quality can be done by removing oxygenated compounds through hydrodeoxygenation (HDO). HDO is a hydrotreatment reactions involving other reactions such as decarbonylation (DCO) and decarboxylation (DCO2). The selectivity of the HDO can be determined by choosing the right reaction conditions and catalysts. Bifunctional catalysts with metal and support are widely utilized due to their good catalytic activity towards HDO. The synergistic effect formed between the metal and support produces active sites that are not found in metal or acid catalysts. Bifunctional catalysts have metal, Brønsted and Lewis acid sites that adsorb oxygenated compounds and facilitate the cleaving of C-O bonds. Zeolites are commonly used as supports due to their high surface area, selective pores, acidity and thermal stability required in HDO reactions. This review discusses the role of metal supported on zeolite bifunctional catalyst on HDO in biogasoline production.

Keywords: Biogasoline, Hydrodeoxygenation, Hydrotreatment, Bifunctional catalyst, Zeolites

Presenter: Mardiana (dia.mardiana29@student.uns.ac.id)

Green_172

The Potency of a Diatom *Cyclotella striata* strain TBI to Decrease Fe(III) Ion Content in Culture Media

Muhammad Yudhistira Azis

Analytical Chemistry Division, Chemistry Department FMIPA ITB

Abstract

Diatoms are microalgae commonly found in nature. Diatoms are capable to live in waters exposed to heavy metals. Several heavy metal's ions are known to be nutrients important for the survival of diatoms, one of which is the Fe(III) ion. Exploring the potency of diatoms in surviving heavy metal's water could be a strategic step to decrease the Fe(III) ion content in waters. For this reason, it is necessary to conduct initial studies on a smaller scale, especially on diatom culture media. This study aims to explore the potential of the diatom Cyclotella striata TBI strain to decrease the Fe(III) ion content in the culture media. The sources of Fe(III) ions used in this experiment were FeEDTA and FeCl3.6H2O. This study was initiated with the cultivation of C. striata on F/2 media and F/2 media containing Fe(III) ion contaminants of 2,00 and 4,00 mg/L from FeEDTA and FeCl3.6H2O. Changes in Fe(III) ion levels in the media were determined using AAS. The results of this study indicate that C. striata grown in F/2 media containing 2,00 mg/L Fe(III) ion contaminants from FeCl3.6H2O grew more than C. striata in F/2 media without contaminants. In both conditions, there was a decrease in Fe(III) ion levels in the growth media. The largest decrease in Fe(III) levels was observed in media containing Fe(III) contaminants, which was 3,80 mg/L. This study shows that C. striata can decrease Fe(III) levels in the media, however, this ability depends on the concentration and source of Fe(III) ions.

Keywords: Cyclotella striata, Ferric chloride hexahydrate, Ferric EDTA, Ferric ions, and AASs

Presenter: Muhammad Yudhistira Azis (yudhistira@itb.ac.id)

Computational Study of the Stability of Vitamin C on the Effect of Solvent and Temperature Compared with Experimental Results

Parsaoran Siahaan, Dwi Hudiyanti

Abstract

Vitamin C is a compound that has various benefits for humans. Vitamin C is unstable to certain environmental conditions. Study of the stability of vitamin C given the effects of solvent and temperature computationally and experimentally is useful for understanding the molecular characteristics of vitamin C in chemistry and its application in life. Computational research was carried out by calculating the stability of vitamin C using the Density Functional Theory and Time-Dependent Density Functional Theory methods. The basis set used in the research is 6-31 G** B3LYP. The state of the electrons is investigated through Self-Consistent Field energy. This stage begins with designing the 3D structure of the conformation of vitamin C. Geometry optimization aims to obtain the most optimized geometric structure. Time-Dependent Density Functional Theory calculations were carried out with the aim of calculating the absorption spectrum of the vitamin C with variations in solvent effects. Gas phase calculations were carried out by providing temperature effects with temperature variations of 273.15K; 298.15K; 310.15K; 313.15K; and 333.15K. The solvent effect calculation was carried out using a variety of solvents in the form of water, DMSO, methanol, ethanol and acetone. Study of the stability interactions of vitamin C using quantum chemistry shows changes in bond length, bond angle, dihedral, geometric optimization energy, partial charge, dipole moment, thermodynamic properties, Raman activity, UV-Vis activity (shift in absorption of certain wavelengths), and band gap. HOMO-LUMO.

Keywords: Vitamin C, stability, DFT, solvent, temperature

Presenter: Sekar Ayu Farida Ali (sekarayufaridaali@students.undip.ac.id)

PARALLEL SESSION II

Parallel A

Moderator: Maulidan Firdaus

Room: 2nd floor Room 1

No	Time	Name	Afiliation	Title
1	**13:55 - 14:07**	**Yohanes Martono**	**UKSW**	**Green Extraction of Phytochemicals from Green Tea Using Natural Deep Eutectic Solvents and Ultrasonic Assisted Extraction**
2	14:09 - 14:46	Erly Grizca Boelan	Universitas Katolik Widya Mandira	Biotransformation of DDT by White-rot Fungus *Phlebia brevispora*
3	14:09 - 14:46	Mukti Rahmah Inayati	UNIMUS	Analysis Of Hexavalent Chromium (Cr-VI) Concentration In Wastewater In Central Java Province
4	14:09 - 14:46	Dewi Kurnianingsih Arum Kusumahastuti	UKSW	Eco-Friendly Fabrication of Silver and Zinc Nanoparticles from Coffee Waste:Characterization and Toxicity Studies
5	14:09 - 14:46	Gunawan	UNDIP	Effect of Heating Temperature Variation in Green Synthesis of Cadmium Hydroxide Nanoparticles on the Effectiveness of Methylene Blue Degradation
6	14:48 - 15:25	Rizka Berliana Putri	ITS	Synthesis of Fatty Acid Hydroxy Propyl Ester as Lubricity Enhancer Bioadditives for Low-Sulfur Diesel Fuel from Waste Cooking Oil through Transesterification
7	14:48 - 15:25	Natasya Rahmaniyah	UNIMUS	Analysis Of Nitrit Levels In Packaged Drinking Water By Diazotation Method Using Uv-Vis Spectrophotometry Equipment
8	14:48 - 15:25	Yunita Alfiyati Firdausa	ITS	Synthesis of Fatty Acid Hyroxyethyl Monoester from Waste Cooking Oil and Ethylene Glycol Using CaO as Catalyst

Green Extraction of Phytochemicals from Green Tea Using Natural Deep Eutectic Solvents and Ultrasonic Assisted Extraction

Yohanes Martono | Jodelin Muninggar

Chemistry Department Faculty of Science and Mathematics Satya Wacana Christian University | Faculty of Medicine and Health Science

Abstract

The research study evaluated the green extraction of phytochemicals from green tea using water, Natural Deep Eutectic Solvents (NADES), and Ultrasonic Assisted Extraction (UAE). Urea, citric acid, and maltodextrin make the NADES. A Simplex Lattice Design model was utilized for optimization, and the variables were urea, citric acid, maltodextrin, and water. The interaction of water, maltodextrin, and citric acid significantly influenced the extraction of total flavonoid compounds, but urea had no discernible impact, according to optimal data. The phytochemicals catechin, EGCG, rutin, quercetin, and kaempferol were higher in concentration after extraction with NADES utilizing the UAE method. Furthermore, these phytochemicals were shielded from heat degradation during extract concentration by combining UAE and NADES with water as a solvent. The antioxidant activity of extract obtained from water-modified NADES extraction was significantly higher than water without NADES extraction. This study demonstrates the potential of NADES to improve the efficiency and sustainability of phytochemical extraction from green tea utilizing water as a solvent and the UAE method.

Keywords: green extraction, NADES, green tea, EGCG, antioxidant

Presenter: yohanes martono (yohanes.martono@uksw.edu)

Green Chemistry_54

Biotransformation of DDT by White-rot Fungus *Phlebia brevispora*

Erly Grizca Boelan | Maria A. Uron Leba | Hildegardis Missa | Anselmus Boy Baunsele

Universitas Katolik Widya Mandira | Universitas Katolik Widya Mandira | Universitas Katolik Widya Mandira | Universitas Katolik Widya Mandira

Abstract

1,1,1-Trichloro-2,2-bis (4-chlorophenyl) ethane (DDT) is one of the persistent organic pollutants (POP) that has a high level of toxicity, can accumulate biologically and is difficult to degrade. Microorganisms such as White-Rot Fungus (WRF) have the ability to metabolize POPs into simpler compounds. In this study, an investigation was conducted on the ability of WRF Phlebia brevispora to transform DDT into simpler compounds in a short incubation time. P. brevispora was able to degrade DDT by 64.25% during 7 days of incubation in Potato Dextrose Broth (PDB) media. Metabolites were identified using gas chromatography/mass spectrometry (GC/MS). This fungus converts DDT into at least three metabolites, namely DDE (1,1-dichloro-2,2-bis (4-chlorophenyl) ethylene), DDD (1,1-dichloro-2,2-bis (4-chlorophenyl) ethane) and DDMU (1-chloro-2,2-bis (4-chlorophenyl) ethylene). The results of the study showed that P. brevispora has the potential ability to transform DDT into simpler compounds.

Keywords: Biotransformation, Biodegradation, White Rot-Fungus, Phlebia brevispora

Presenter: Erly Grizca Boelan (earlygrizca@gmail.com)

Materials Chemistry_138

Analysis Of Hexavalent Chromium (Cr-Vi) Concentration In Wastewater In Central Java Province

Dewi Rokhmatul Adhimah[1]*,Urnika Shouta Hasana[2],Mukti Rahmah Inayati[3], Fitria Fatichatul Hidayah[4]

Chemistry Education Study Program, Faculty of Education and Humanities, Muhammadiyah University Semarang, Semarang, Indonesia

Corresponding author: adhimahdewi3@gmail.com1*, urnikash@gmail.com2, muktirahmah12@gmail.com3 fitriafatichatul@unimus.ac.id4**Abstract**

Water is essential for improving the quality of human life. In line with the rapid growth of population and industry, water sources are increasingly being found to be contaminated by domestic and industrial waste, including the hazardous metal Hexavalent Chromium (Cr-VI). This research aims to analyze the concentration of Cr-VI in wastewater. The concentration analysis is conducted using the spectrophotometry method, referring to the Indonesian National Standard Number 6989.71:2009 on water and wastewater. The principle of the analysis is that Cr-VI ions react with diphenylcarbazide in an acidic environment to form a red-purple complex compound that absorbs visible light at a wavelength of 530 nm or 540 nm. The samples used were wastewater collected over a two-week period, totaling 15 samples. All tested wastewater samples were found to be below the maximum allowable concentration limit of Cr-VI, according to water quality standards. The calibration curve value obtained was 0.99952. From the analysis results, monitoring and inspection were carried out on each wastewater sample before it was discharged into rivers or water bodies to ensure that Cr-VI concentrations do not increase and harm the ecosystem, leading to pollution.

Keywords: Wastewater, Hexavalent Chromium Concentration, Spectrophotometry

Presenter: Mukti Rahmah Inayati (muktirahmah12@gmail.com)

Nanomaterials_50

Eco-Friendly Fabrication of Silver and Zinc Nanoparticles from Coffee Waste:Characterization and Toxicity Studies

Dewi Kurnianingsih Arum Kusumahastuti

Satya Wacana Christian University

Abstract

Green synthesis methods for nanoparticles have been the focus of much research due to growing concerns about environmental sustainability. This work investigates the environmentally benign synthesis of zinc (ZnNPs) and silver (AgNPs) nanoparticles utilising coffee waste extracts. The main goal is to create a sustainable method for producing nanoparticles by using a resource that is frequently discarded, and then carefully characterise the final product. In the synthesis process, coffee waste extract acts as a reducing agent, substituting dangerous chemicals and lessening the impact on the environment. To ascertain the optical, structural, and surface characteristics of the nanoparticles, techniques such as UV-Vis spectroscopy, FTIR, XRD, SEM-EDX, and zeta potential analysis are employed. Toxicological experiments on bacterial and Daphnia magna cultures are used to evaluate the biological safety of the synthesised nanoparticles. This research not only provides a sustainable method for nanoparticle production but also offers insight into the potential environmental and biological impacts of the nanoparticles. By using coffee waste, this study contributes to waste valorization and the development of green nanotechnology practices.

Keywords: nanoparticles, coffee, zinc, silver, toxicity

Presenter: Dewi Kurnianingsih Arum Kusumahastuti (dewi.hastuti@uksw.edu)

Materials Chemistry_119

Effect of Heating Temperature Variation in Green Synthesis of Cadmium Hydroxide Nanoparticles on the Effectiveness of Methylene Blue Degradation

Sarifatul Fatimah, Gunawan, Khabibi

Universitas Diponegoro

Abstract

Synthesis of Cd(OH)2 nanoparticles has been conducted using green tea leaf extract with variations in heating temperature and tested for its effectiveness in degrading methylene blue. The study covered preparation of tea leaf extract, synthesis of green Cd(OH)2 nanoparticles using CdSO4 with variations in heating temperature at 70, 80, 90 and 100°C. Analysis using UV-Vis spectrophotometer for photocatalytic kinetics study. Cd(OH)2-80 and Cd(OH)2-90 catalysts were characterized using FTIR, XRD, SEM, TGA, UV-Vis DRS. The result was obtained Cd(OH)2 brown fine powder nanoparticles. FTIR results showed the presence of Cd(OH)2 peak. The crystal structure of the XRD results is monoclinic with the crystal size obtained getting smaller as the temperature increases, which is 43.34 nm for Cd(OH)2-80 and 31.06 nm for Cd(OH)2-90. SEM image of Cd(OH)2 NPs were coarse crystalline rods accompanied by agglomeration. The weight loss in Cd(OH)2-80 and Cd(OH)2-90 were 4.78% and 2.98%, respectively. The band gap values of Cd(OH)2-80 and Cd(OH)2-90 were 2.16 and 2.15 eV. The effectiveness of cadmium hydroxide in degrading methylene blue of Cd(OH)2-70, Cd(OH)2-80, CH-90, and Cd(OH)2-100 were 66.92; 68.76; 72.71; and 70.21% on the photocatalytic optimum condition under ultraviolet light for 120 min using 20 mg of Cd(OH)2 with 4 ppm methylene blue.

Keywords: Nanoparticle, Cd(OH)2, photocatalysis, methylene blue

Presenter: gunawan (gunawan@live.undip.ac.id)

Synthesis of Fatty Acid Hydroxy Propyl Ester as Lubricity Enhancer Bioadditives for Low-Sulfur Diesel Fuel from Waste Cooking Oil through Transesterification

Rizka Berliana Putri

Department of Chemistry, Institut Teknologi Sepuluh Nopember

Abstract

Desulfurization of diesel fuel which is seen as a way out to reduce pollution, unfortunately leads to reducing the lubricity due to the loss of other polar groups such as oxygen and nitrogen. As a result, friction between engine surfaces increases and the engine wears out easily. It is necessary to enhance the lubricity of diesel fuel through the addition of additives. Waste cooking oil that modified into fatty acid hydroxy propyl ester is potential for lubricity enhancer bioadditives. Synthesis of fatty acid hydroxy propyl ester was carried out trough transesterification in vacuum distillation system for 6 h. Mole ratio of oil : propylene glycol was adjusted to 1:7 with 7% w/w oil of catalyst using K2CO3 and CaO- as variations. Product yield of K2CO3 and CaO catalysts were found to be 69% and 66% respectively. The products were characterized using Gas Chromatography-Mass Spectrometry and obtained relative abundance of fatty acid hydroxy propyl esters with 42,52% for K2CO3 and 38,35% for CaO. Furthermore, tribological properties were tested with High-Frequency Reciprocating Rig to determine the lubricating power. The result showed this compound has good lubricity and can be proposed as an alternative bioadditives for low sulfur diesel fuel lubricity enhancer.

Keywords: bioadditives, fatty acid hydroxy propyl ester, lubricity enhancer, transesterification

Presenter: Rizka Berliana Putri (rizkaberliana42@gmail.com)

Materials Chemistry_139

Analysis Of Nitrit Levels In Packaged Drinking Water By Diazotation Method Using Uv-Vis Spectrophotometry Equipment

Moh. Rizky Febriansyah | Natasya Rahmaniyah

Universitas Muhammadiyah Semarang | Universitas Muhammadiyah Semarang

Abstract

Bottled drinking water distributed to the public must meet drinking water quality standards stipulated based on the Regulation of the Minister of Health of the Republic of Indonesia No. 492/Menkes/Per/IV/2010 concerning requirements and supervision of drinking water quality. One of the tests carried out was testing the analysis of nitrite levels in drinking water using the diazotation method with Uv-Vis spectrophotometric measurements. The aim of the research was to analyze the nitrite content in the three bottled water samples. The test sample data consists of 3 different test times with a total of 5 samples. Samples 158 and 159 resulted in nitrite levels of 0.009 and 0.002 mg/L, then sample 162 obtained nitrite levels of 0.001 mg/L, finally sample 174 was obtained. The result of the nitrite level was 0.006 mg/L, sample 175 resulted in a nitrite level of 0.000 mg/L. All samples met the requirements that had been set for the maximum limit of nitrite levels as N – NO2 in drinking water at 3 mg/L

Keywords: Nitrite : Bottled drinking water : drinking water quality

Presenter: Natasya Rahmaniyah (natasyaarahmaniyah@gmail.com)

Synthesis of Fatty Acid Hyroxyethyl Monoester from Waste Cooking Oil and Ethylene Glycol Using CaO as Catalyst

Yunita Alfiyati Firdausa

Intitut Teknologi Sepuluh Nopember

Abstract

Bio-additives development was encouraged by the desulfurization process on fossil diesel fuel, which has decreased its lubricity. In this study, fatty acid hydroxyethyl monoester (HEMAL) compounds were synthesized as high-potential bio-additives. The synthesis was carried out by utilizing waste cooking oil (WCO) through a transesterification process with methanol using a KOH catalyst to obtain intermediate compounds in the form of fatty acid methyl esters (FAME). This reaction was carried out with the following reaction parameters: methanol:oil molar ratio of 6:1, catalyst concentration of 1% (w/w oil), reaction time of 165 minutes, and temperature of 65 °C in a reflux system, which yielded 85.39% with a free fatty acid concentration of 0.22%. Afterward, the FAME intermediates were reacted with ethylene glycol (EG) and CaO heterogeneous base catalyst using the reaction parameters of a 2:3 molar ratio, 1.2% catalyst concentration (w/w oil), 6 hours of reaction time, and 130°C temperature in a vacuum distillation system. Based on the analysis of FAME composition using a Chromatography-Mass Spectrometer (GC-MS), it is known that WCO consists mostly of palmitic and oleic acids. This is also shown by the final product of HEMAL compounds, which consisted of 31,221% hydroxyethyl monoester palmitate and 36,258% hydroxyethyl monoester oleate, for a total abundance of HEMAL compounds as a whole of 78.31%. The main composition of HEMAL in the form of hydroxy groups and the high concentration of unsaturated fatty acids derived from oleic acid have high potential to be used as bio-additives to increase the lubricity of commercial fuels.

Keywords: Bio-additives, CaO, Ester, FAME, Hydroxyethyl ester.

Presenter: Yunita Alfiyati Firdausa (yunitaalfiyati@gmail.com)

Parallel B

Moderator: Sarawinda Hutagalung, S.Si., M.Sc.

Room: 2nd floor Room 2

No	Time	Name	Afiliation	Title
1	**13:55 - 14:07**	**Fransisca Widhi Mahatmanti**	**UNNES**	**Smart and Green Packaging Made from Chitosan-based Biofilm with the Addition of Ginger Oil and Anthocyanins from Butterfly Pea Flower Extract (*Clitoria Ternatea* L)**
2	14:09 - 14:46	Ulfah Lailatul Khoiriah	ITS	Modification of Lysis Buffers for Detecting Pork Content in Food Products
3	14:09 - 14:46	Muhammad Cholid Djunaidi	UNDIP	Synthesis Of Polyeugenolsulphonate/Ag^{+} as an Antibacterial Coating On Cotton Fabric
4	14:09 - 14:46	Alya Shifa Azzachra	UNDIP	Case Study: Semi- Quantitative Test of Formalin Content in Food Ingredients (Anchovies, Rice, Salted Fish, Wet Yellow Noodles) in One of the Traditional Markets of Semarang City
5	14:09 - 14:46	Sofa Farida	BRIN	Development of a Nano-Emulsion Serum Combining Centella asiatica Herbal Extract and Ginger Oil for Anti-Aging Benefits **(online)**
6	14:48 - 15:25	Lasmaryna Sirumapea	STIFI Bhakti Pertiwi Palembang	Acrylamide Based Of Molecularly Imprnted Polymer, A Selective Sorbent For Analysis Meropenem In Blood Plasma **(online)**
7	14:48 - 15:25	Agnes Dyah Novitasari Lestari	Universitas Papua	Synthesis of bioplastic based on chitosan – sago starch (*Metroxylon sago*) with the addition of black fruit (*Haplolobus* sp.) Leaves ethanolic extract **(online)**
8	14:48 - 15:25	La Ode Agus Salim	UNHAS	Electroanalytical performance Fipronil Pesticide Detection using ZnO Nanorods-Graphene composites electrode**(online)**
9	14:48 - 15:25	Mashuni Mashuni	Halu Oleo University	Novel Cashew Shell Tar-Modified Cellulose Sponge for Effective Adsorption of Nickel (Ni2+) Metal Ions**(online)**

Materials Chemistry_60

Smart and Green Packaging Made from Chitosan-based Biofilm with the Addition of Ginger Oil and Anthocyanins from Butterfly Pea Flower Extract (*Clitoria Ternatea* L)

Fransisca Widhi Mahatmanti

Chemistry Study Program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, Indonesia

Abstract

A chitosan-based biofilm modified with ginger essential oil and butterfly flower extract has been made. This biofilm was tested for its potential as a raw material for smart and environmentally friendly packaging (smart and green packaging). The potential of biofilm as a packaging raw material is known from the characterization results, which include color changes at various pHs, mechanical properties, antioxidant properties, antibacterial properties, and morphological structure. The produced biofilms exhibit sensitivity to alterations in pH levels, manifesting distinct color transitions from pink and purple to green within the pH range of 1 to 12. This phenomenon arises due to adding butterfly flower extract into the biofilm, which contains anthocyanin dyes with a total concentration of 1113.3 mg/L. The introduction of additional extracts enhances the antioxidant and antibacterial attributes of the biofilm. In the color and pH response assessment, the biofilm augmented with a 7.5% v/v extract exhibited a color difference value (ΔE) exceeding 5 across all assessed pH values. These findings signify the observable color variations in the biofilm due to pH fluctuations with the unaided eye. According to the outcomes of characterization and analysis, the produced biofilm holds promise as an environmentally friendly packaging solution due to its reliance on natural components and its endowed antioxidant and antibacterial properties, contributing to the prolonged preservation of packaged food items. Moreover, the biofilm demonstrates the capability to gauge the quality of food products based on their pH, which is evident through direct color alterations.

Keywords: Smart and Green Packaging; chitosan; ginger oil; butterfly flower extract

Presenter: Fransisca Widhi Mahatmanti (fwidhi_kimia@mail.unnes.ac.id)

Chemistry of Natural Products_38

Modification of Lysis Buffers for Detecting Pork Content in Food Products

Ulfah Lailatul Khoiriah | Pramudja Baydillah | Raden Darmawan | Nasori | Setiyo Gunawan

Chemical Engineering Department, Institut Teknologi Sepuluh Nopember, Surabaya, 61211, Indonesia. | Chemical Engineering Department, Institut Teknologi Sepuluh Nopember, Surabaya, 61211, Indonesia. | Chemical Engineering Department, Institut Teknologi Sepuluh Nopember, Surabaya, 61211, Indonesia | Physic Department, Institut Teknologi Sepuluh Nopember, Surabaya, 61211, Indonesia | Chemical Engineering Department, Institut Teknologi Sepuluh Nopember, Surabaya, 61211, Indonesia ; Community Engagement Center for Halal, Institut Teknologi Sepuluh Nopember, Surabaya, 61211, Indonesia

Abstract

The increasing number of cases of counterfeit processed food products with non-halal ingredients, such as pork, have caused public concern about the halalness of food products in Indonesia, especially the Muslim community. This has led to the development of halal testing methods, one of which is DNA isolation needed to obtain genetic material that is amplified using the polymerase chain reaction (PCR) technique to detect the DNA content of pigs. The main purpose of this research was to modify the lysis buffer using Tris-Ethylenediaminetetraacetic Acid (EDTA), Cetyl Trimethylammonium Bromide (CTAB), salt, alkaline, and urea. The results of DNA isolation using the Maxwel® RSC PureFood GMO and Authentication Kit with conventional methods were also compared. Using a Quantus™ Fluorometer, it was proven that the kit-based method produced higher DNA concentrations in pork meat (165 ng) and pork sausage samples (160 ng) than those of the conventional methods. The higher DNA concentration was obtained with the addition of salt resulting in 102 ng (pork meat) and 95.50 ng (pork sausage). The results of DNA isolation were analyzed using PCR showed that the higher extracted DNA concentration in the sample, the lower the Cycle Quantification (Cq) value.

Keywords: DNA extraction, halal foods, halal testing, lysis buffer, real-time PCR

Presenter: Ulfah Lailatul Khoiriah (ulfahlailatul24@gmail.com)

Polymer Chemistry_107

Synthesis of Polyeugenolsulphonate/Ag^+ as An Antibacterial Coating on Cotton Fabric

Muhammad Cholid Djunaidi | Khabibi | Dandy Andhika Fatriaji | Nesti Dwi Maharani

Universitas Diponegoro | Universitas Diponegoro | Universitas Diponegoro | Universitas Diponegoro

Abstract

A The synthesis of polyeugenol sulfonate/Ag+ has been carried out as a coating for cotton fabrics. Eugenol can be polymerized to polyeugenol using Bronsted-Lowry or Lewis acid via cationic polymerization. Polyeugenol has a slow response category of antibacterial activity, so it antibacterial activity can be developed by adding a sulfonate group through sulfonation with concentrated H2SO4. Polyeugenol sulfonate (PE-SO3H) was impregnated with silver Ag+ to increase antibacterial activity. In this study, polyeugenol was successfully synthesized using two catalysts namely BF3-diethyl ether and H2SO4-CH3COOH with an average molecular weight of 12753 gmol-1 and 16983 gmol-1. The synthesized polyeugenol sulfonate had a sulfonation degree of 72.045% and 86.79%, respectively. Ag+ impregnation of polyeugenol sulfonate was proven by XRD according to the peaks of Ag standard and AAS with adsorbed percentages of 86% and 84.9%, respectively. The morphology of the PE-SO3H/Ag+ coated fabric showed thickening of the fabric and white dots which were thought to be Ag with a composition of 0.27% and 0.31%, respectively. PE-SO3H/Ag+ composite at a concentration of 20 mg/mL had moderate antibacterial activity with a zone of inhibition reaching 7.86 mm against E.coli bacteria and 8.04 mm against S. aureus bacteria. Fabrics coated with PE-SO3H/Ag+ with a concentration of 20 mg/ml had antibacterial activity with a percentage of inhibition of 25.51% against E.coli bacteria and 26.94% against S. aureus bacteria which stated that PE-SO3H/Ag+ had potential as antibacterial coating material on cotton fabric with moderate response category.

Keywords: eugenol, polymer, polyeugenol, polyeugenol sulfonate, impregnation, silver, spray coating, antibacterial

Presenter: Muhammad Cholid Djunaidi (choliddjunaidi@live.undip.ac.id)

Case Study: Semi- Quantitative Test of Formalin Content in Food Ingredients (Anchovies, Rice, Salted Fish, Wet Yellow Noodles) in One of the Traditional Markets of Semarang City

Alya Shifa Az-zachra, Lizza Nurdiana, Endang Tri Wahyuni Maharani

Universitas Diponegoro, Semarang

Abstract

Formalin is a food additive that is prohibited from use based on the Regulation of the Ministry of Health of the Republic of Indonesia Number 033 year 2012 , so its content in food products must be negative. So based on these problems, researchers are interested in conducting research on testing the content of formaldehyde in food ingredients in the form of anchovy rice, salted fish, and wet yellow noodles. This study is an experimental study conducted in February - March 2024 located in three traditional markets in Semarang City. Food samples were taken from wet yellow noodles, anchovy rice, and salted fish. The formalin content analysis was conducted at the UPTD Health Laboratory of Semarang Regency using the colorimetric method with Test Strips & Reagents or semi-quantitative treatment with the KIT test. The results of the formalin test conducted on three samples, namely anchovy rice, salted fish, and wet yellow noodles, showed that one sample was positive for formalin at a high level. The wet yellow noodles tested using the colorimetric method with Test Strips & Reagents showed formalin levels of 100 grams.

Keywords: Anchovy Rice, Salted Fish, Wet Yellow Noodle, Formalin

Presenter: Alya Shifa Azzachra | Lizza Nurdiana (alyashifa112@gmail.com)

Development of a Nano-Emulsion Serum Combining *Centella asiatica* Herbal Extract and Ginger Oil for Anti-Aging Benefits

Sofa Farida

Research Center for Pharmaceutical Ingredient and Traditional Medicine, National Agency of Research and Innovation, Cibinong, Bogor 16915, West of Java, Indonesia

Abstract

Centella asiatica and *Zingiber officinale* are known for their potent antioxidant and anti-inflammatory properties, making them effective agents in combating aging. However, their bioavailability is significantly limited due to low water solubility. To enhance the absorption and bioavailability of these active compounds in target organs, advanced dosage formulations are being developed—one such method involves nanoparticle technology. The objective of this study was to determine the optimal nanoemulsion formula incorporating Centella asiatica herb extract (CHE) and ginger essential oil (GEO). Dechlorophyllated Centella Herb Extract (DCHE), which refers to Centella herb extract (CHE) with the chlorophyll removed, was utilized in this study. Ginger essential oil (GEO) was obtained through Stahl distillation. To optimize the nanoemulsion base, appropriate carrier oils, surfactants, and co-surfactants were selected. The physical characteristics of the resulting nanoemulsion were then assessed by measuring droplet size and zeta potential. Based on the findings of this study, canola oil has been identified as the most suitable carrier oil for dissolving DCHE. The appropriate surfactants and cosurfactants were determined to be Tween 80 and PEG 400. The particle size of the nanoemulsion containing DCHE and GEO was measured at 24.4 ± 0.53 nm, with a zeta potential of -2.66 ± 0.11 mV. An appropriate base for formulating DCHE and GEO nanoemulsions has been identified as a combination of canola oil, Tween 80, and PEG 400 in the ratio of 1:8:1.

Keywords: Centella asiatica, Zingiber officinalae, nano emulsion, anti-aging

Presenter: Sofa Farida (sofafarida9@gmail.com)

Materials Chemistry_37

Acrylamide Based of Molecularly Imprnted Polymer, A Selective Sorbent for Analysis Meropenem in Blood Plasma

Lasmaryna Sirumapea

STIFI Bhakti Pertiwi Palembang

Abstract

The wide use of meropenem as antibiotics , lead us to find out the proper and selective analysis of meropenem. Molecularly imprinted polymer for meropenem (MerIP) as the selective sorbent was prepared through a bulk polymerization reaction. Acrylamide, ethylene glycol dimethacrylate, benzoyl peroxide, and dimethyl sulfoxide were applied as functional monomer, crosslinker agent, initiator, and solvent, respectively. Scanning electron microscopy, thermogravimetric analysis, Brunauer-Emmett-Teller analysis, and Fourier transform infrared spectroscopy were used to characterize the imprinted polymers. The maximum adsorption capacity was achieved at pH = 3, after 4 h contacted, under 150 rpm, and 40 mg of polymer applied. The maximum adsorption capacity of MerIP for meropenem was 59.91 mg/g; the synthesized polymer had superior selectivity to meropenem compared to that of the other antibiotics. Selectivity to non-imprinted polymer, IF = 4.86. Thermodynamic and kinetic analyses indicated that the results suited with the Freundlich model and the pseudo-second-order kinetic model, respectively. Mer-IP was selective in batch adsorption, and molecularly imprinted solid-phase extraction protocols were selective to meropenem. It was then applied to analyze meropenem in human blood plasma and resulted in 83.86 % of recovery.

Keywords: acrylamide; meropenem; molecularly imprinted polymer; selective; solid-phase extraction

Presenter: lasmaryna sirumapea (lasmaryna2906@gmail.com)

Synthesis Of Bioplastic Based On Chitosan – Sago Starch (*Metroxylon sago*) With The Addition Of Black Fruit (*Haplolobus* sp.) Leaves Ethanolic Extract

Agnes Dyah Novitasari Lestari*), Muchammad Fauzan Kuri Pasai, Evelina Somar, Dewi Eviane, Gabriella Shine De Kweldju

Universitas Papua, Institut Teknologi Yogyakarta

Abstract

Bioplastic as an antioxidant and antibacterial packaging has been synthesized from chitosan and sago starch with black fruit leaves ethanolic extract. The bioplastic synthesis was carried out by mixing a solution of chitosan, sago starch, glycerol, and ethanol extract of black fruit leaves, pouring it into a petri dish then drying it in an oven. The bioplastic was characterized using FTIR, and its performance was tested. The FTIR spectra showed the presence of hydrogen bonds between the OH groups in starch and the NH groups of chitosan. The effect of adding the ethanol extract of black fruit leaves was indicated by the presence of aromatic OH and CH groups derived from tannins. Increasing the weight ratio of chitosan/sago starch gave the effect of increasing tensile strength, decreasing elongation, decreasing thickness, and increasing biodegradation time. The addition of ethanol extract of black fruit leaves reduces tensile strength at a chitosan/starch weight ratio of 4:1, increases tensile strength at a starch/chitosan weight ratio of 1:1, tends to reduce elongation at both starch/chitosan ratios, tends to increase thickness at a chitosan/starch weight ratio of 4:1, decreases thickness at a chitosan/starch weight ratio of 1:1, and increases biodegradation time.

Keywords: Bioplastic, chitosan, Haplolobus sp., glycerol, sago starch

Presenter: Agnes Dyah Novitasari Lestari (a.dyahnovitasari@gmail.com)

Electro_159

Electroanalytical performance Fipronil Pesticide Detection using ZnO Nanorods-Graphene composites electrode

La Ode Agus Salim, Paulina Taba, Muhammad Zakir, Muhammad Nurdin

Doctoral Program of Chemistry, Graduate School, Hasanuddin University, Makassar 90245 - South Sulawesi, Indonesia, Department of Chemistry, Faculty of Mathematics and Natural Sciences, Hasanuddin University, Makassar 90245 - South Sulawesi, Indonesia, Department of Chemistry, Faculty of Mathematics and Natural Sciences, Hasanuddin University, Makassar 90245 - South Sulawesi, Indonesia, Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Halu Oleo, Kendari 93231 – Southeast Sulawesi, Indonesia

Abstract

This study explores the effect of ZnO nanorods (ZnO NRs) on the performance of graphene-based nanocomposite electrochemical sensors for fipronil pesticide detection. The amount of ZnO NR was varied, while the quantities of graphene and paraffin remained constant. The findings reveal that the ZnO NR-graphene electrode demonstrates exceptional sensitivity to fipronil, with an increase in ZnO NR concentration leading to enhanced sensitivity, reaching its optimal level at 2 w/w (with graphene around 3 w/w). The detection limit of the nanoelectrode is approximately 0.1 µg/L, which is below the maximum allowable residue levels of fipronil in water (~0.1 µg/L) and within the safe limits for food products (~5 µg/L). Moreover, the nanoelectrode shows remarkable chemical stability, with only about a 0.30% decline in performance (%RSD) after 12 repeated measurements. The observed improvement in electron transfer rates is largely attributed to the superior physicochemical properties of anatase ZnO NRs within the graphene matrix, which are the main contributors to enhanced sensor performance. The ZnO NR-graphene electrode system holds significant promise for applications in environmental fipronil pesticide monitoring and the quality control of agricultural products.

Keywords: Gr, ZnO NR, Voltammetry, Fipronil, Pesticides

Presenter: La Ode Agus Salim (agus.123742@gmail.com)

MatChem_164

Novel Cashew Shell Tar-Modified Cellulose Sponge for Effective Adsorption of Nickel (Ni2+) Metal Ions

Mashuni Mashuni, Rini Rulianti, La Ode Ahmad, Fitri Handayani Hamid, M Jahiding, Sitti Hadijah Sabarwati

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Halu Oleo University, Department of Chemistry, Faculty of Mathematics and Natural Sciences, Gadjah Mada University, Department of Chemistry, Faculty of Mathematics and Natural Sciences, Halu Oleo University, Study Program of Chemistry, Institute of Science Technology and Health 'Aisyiyah Kendari, Department of Physics, Faculty of Mathematics and Natural Sciences, Halu Oleo University, Department of Chemistry, Faculty of Mathematics and Natural Sciences, Halu Oleo University

Abstract

The synthesis of a novel cellulose sponge modified with tar derived from cashew nut shells (Anacardium occidentale L.) through pyrolysis has been successfully achieved. This tar-modified cellulose sponge was employed as an adsorbent to remove Ni2+ metal ions from aqueous solutions effectively. Various parameters, including pH, contact time, and initial ion concentration, were investigated to optimize adsorption. The adsorbent was prepared by creating a viscous solution (9.72% cellulose acetate and 5.49% NaOH) mixed with 2 g of cotton fibres, Na2SO4.10H2O crystals, 10 mL of glutaraldehyde, and 5 mL of tar. The mixture was heated on a hotplate at 100°C for 2 hours, then dried in an oven at 100°C for another 2 hours. Characterization of the tar-modified cellulose sponge using FTIR revealed the presence of functional groups such as –OH, C-H, C-O-C, C=O, C=C, and N-H. The experimental results demonstrated that the optimal conditions for Ni2+ ion adsorption were at pH 5, with a contact time of 60 minutes and an initial Ni2+ concentration of 12 mg/L. The adsorption of Ni2+ ions was found to follow the Freundlich isotherm model, with an adsorption capacity of 0.1704 mg/g and an adsorption energy of 4.9543 kJ/mol, indicating that the process is predominantly physical adsorption. This novel approach presents a promising method for efficiently removing heavy metal ions from contaminated water using a sustainable and eco-friendly adsorbent.

Keywords: Adsorption, Cashew Shell, Cellulose, Nickel, Sponges

Presenter: Mashuni Mashuni (mashuni@uho.ac.id)

Parallel C

Moderator: Mar'attus Solihah, M.Pd.

Room: 4th floor meeting room

No	Time	Name	Afiliation	Title
1	**13:55 - 14:07**	**Eko Yuliyanto**	**Universitas Muhammadiyah Semarang**	**Integrating Sea Level Rise Field Trips into Climate Change Education: A Study on Pre-Service Teachers in Central Java, Indonesia**
2	14:09 - 14:46	Anita Fibonacci	UIN Walisongo Semarang	Revealing the Educational Maze: Exploring the Learning Difficulties Experienced by Pre-Service Chemistry Teachers
3	14:09 - 14:46	Mutiara Hikmah	UNNES	Development of Interactive Educational Application Getting to Know Hydrocarbon Compounds Based on Augmented Reality to Improve The Students' Creative Thinking Skills
4	14:09 - 14:46	Harjito	UNNES	Evaluation of Chemistry Education Students' Ability to Integrate Macroscopic, Microscopic, and Symbolic Aspects in Learning Media
5	14:09 - 14:46	Tita Pratama Annissa	UNDIP	Interaction Properties and Molecular Dynamics in the EC1-EC2 domain E-cadherin Complex with Chitosan, ADTC5 and Vitamin C
6	14:48 - 15:25	Mar'attus Solihah	UIN Walisongo Semarang	Analyzing Students' Science Generic Skill of UIN Walisongo Using Rasch Model
7	14:48 - 15:25	Jonathan M Siagian	Institut Teknologi Sumatera	Cationic Dye Separator Based On 2,2,6,6-Tetramethylpiperidine-1-Oxyl(Tempo) Oxidized Cellulose
8	14:48 - 15:25	Sabella Vegasty	UNS	Characteristic, Bioactivity, and Application of Chitosan-Starch Edible Film with Added Essential Oil in Food Preservation
9	14:48 - 15:25	Patiha	UNS	Improving the Usefulness of Renewable Langmuir Adsorption Isotherm Equation for the Study of Adsorption Phenomena

Integrating Sea Level Rise Field Trips into Climate Change Education: A Study on Pre-Service Teachers in Central Java, Indonesia

Eko Yuliyanto | Siti Masitoh | Alim Sumarno

Universitas Muhammadiyah Semarang | Surabaya State University | Surabaya State University

Abstract

The development of climate change education models has been extensive; however, there is a notable absence of approaches incorporating field trips focused on sea level rise for pre-service teachers, particularly in Indonesia's coastal regions. This study aims to assess the feasibility of using field trip-based learning strategies and student worksheets and to evaluate pre-service teacher students' responses following the implementation of this experiential learning model. The research began with a comprehensive literature review on climate change and its tangible impacts on the northern coast of Central Java, Indonesia. Subsequently, a learning model strategy and student worksheets were developed and validated by three experts to determine their feasibility. The final stage involved implementing the learning model and evaluating student responses. The validation results indicated that the field trip-based learning model strategy and student worksheets were highly feasible. Post-implementation, students provided positive feedback on the climate change learning process. Given the limited implementation of field trip-based learning among pre-service teachers, further research is recommended on a larger scale, involving a greater number and diversity of pre-service teacher students, to more comprehensively assess its effectiveness in enhancing understanding.

Keywords: Climate Change Education; Field Trip; Sea Level Rise; Pre-Service Teacher ; Experiential Learning

Presenter: Eko Yuliyanto (ekoyuliyanto@unimus.ac.id)

Revealing the Educational Maze: Exploring the Learning Difficulties Experienced by Pre-Service Chemistry Teachers

Anita Fibonacci, Asep Kadarohman, Hernani, Nuryani Rustaman, Roslinawati Roslan

Universitas Pendidikan Indonesia (UPI) Bandung, UIN Walisongo Semarang, Universiti Brunei Darussalam

Abstract

It's important to comprehend the challenges encountered by pre-service chemistry teachers for enhancing the quality of chemistry education. This study explored learning difficulties faced by pre-service chemistry teachers and the proposed solutions to address these challenges. Fifty-four pre-service chemistry teachers at an Islamic university in Java, Indonesia, were involved as research subjects. Questionnaires, interviews, and observation techniques were conducted to determine the perspectives of pre-service chemistry teachers regarding their learning difficulties. The results of the study showed that the courses that prospective teachers find most difficult are organic chemistry courses (36%), structure elucidation courses (26%), physical chemistry (23%), instrumental analysis chemistry (6%), and inorganic chemistry (6%), Biochemistry (2%), Basic chemistry (2%). Most respondents hoped that they would be given visualization assistance that was not just a computer simulation but also combined with the three-dimensional products on the computer/ tangible product to study the spatial structure of molecules.Keywords: Pre-service chemistry teachers, chemistry, learning difficulties

Keywords: Pre-services chemistry teachers, chemistry, learning difficulties

Presenter: AnitaFibonacci (anitafibonacci@walisongo.ac.id)

Development of Interactive Educational Application Getting to Know Hydrocarbon Compounds Based on Augmented Reality to Improve The Students' Creative Thinking Skills

Mutiara Hikmah | Sigit Priatmoko

Semarang State University | Semarang State University

Abstract

The purpose of this study is to develop android-based chemistry learning media through the integration of augmented reality (AR) technology and evaluate its feasibility and effectiveness to improve students' creative thinking skills in studying the molecular structure of hydrocarbon compounds The learning media developed is in the form of an android application designed by utilizing Unity 3D software, Vuforia library for marker creation, and Blender for 3D object creation. This research is a development research (R&D) with a 4D development model. Data collection was carried out through content and material validation questionnaires, student and teacher response questionnaires, and creative thinking ability tests on hydrocarbon materials. The results of the study show that the ARCHEMIST application is declared valid with a very good category and is very feasible to use. Teachers and students gave a very decent response with an average of 95% and 78% of eligibility percentages, respectively. The effectiveness of using the application to improve creative thinking skills is evidenced by the N-gain value of 0.84 with a high category. Meanwhile, students' creative thinking skills in the aspects of fluency, flexibility, elaboration, originality, and elimination in the experimental class were 84.02%, 80.28%, 76.13%, 83.95%, and 92.25%. It can be concluded that the ARCHEMIST application developed is very qualified to be used as a chemistry learning medium and is able to effectively improve students' creative thinking skills.

Keywords: Chemistry, Hydrocarbons, Applications, Augmented Reality, Creative Thinking Skills

Presenter: Mutiara Hikmah | Sigit Priatmoko (mhikmah777@students.unnes.ac.id | sigitwarsono65@mail.unnes.ac.id)

Evaluation of Chemistry Education Students' Ability to Integrate Macroscopic, Microscopic, and Symbolic Aspects in Learning Media

Harjito

Universitas Negeri Semarang

Abstract

This research is motivated by the level of relevance of learning media created by prospective chemistry teachers between conceptual symbolic aspects and macroscopic/factual aspects that are lacking. Microscopic aspects are very important because they are the link between observed facts (macroscopic) and symbolic. Based on the researcher's experience as an assessor of PPG program students from 20 media compiled by students, less than 5 of the media compiled touch on essential concepts and involve explanations of microscopic aspects. The media tends to jump from facts directly to symbolic aspects. This study aims to reveal the level of understanding of chemistry education students at Semarang State University regarding how to present media appropriately and be able to link factual macroscopic aspects with conceptual symbolic aspects. The study was conducted with 60 chemistry education students using a comprehension test in the form of 4-option choices. The analysis was carried out qualitatively-quantitatively. The results of the analysis showed that the level of understanding of chemistry education students regarding how to present media appropriately is still lacking (below 60%).

Keywords: Students' Ability, Macroscopic, Microscopic, Symbolic, Learning Media

Presenter: Harjito (harjito@mail.unnes.ac.id)

Interaction Properties and Molecular Dynamics in the EC1-EC2 domain E-Cadherin Complex with Chitosan, ADTC5 and Vitamin C

Tita Pratama Annissa | M. Cholid Djunaidi | Dwi Hudiyanti | Parsaoran Siahaan*

Physical Chemistry Laboratory, Department of Chemistry, Faculty of Science and Mathematics, Diponegoro University, Semarang, Indonesia | Analytic Chemistry Laboratory, Department of Chemistry, Faculty of Science and Mathematics, Diponegoro University, Semarang, Indonesia | Physical Chemistry Laboratory, Department of Chemistry, Faculty of Science and Mathematics, Diponegoro University, Semarang, Indonesia | Physical Chemistry Laboratory, Department of Chemistry, Faculty of Science and Mathematics, Diponegoro University, Semarang, Indonesia

Abstract

Difficulty in delivering drugs to the central nervous system is one of the causes of various efforts to modulate the blood brain barrier (BBB) in the application of drug delivery to target cells. Chitosan a compound derived from chitin, is a bridge in drug delivery applications which acts as a carrier and protector. The ADTC5 peptide has the ability to inhibit interactions between cells. In this study, vitamin C is used as a model drug which is a strong antioxidant because of its ability to donate hydrogen atoms to neutralize free radicals. The ability of chitosan, ADTC5 and vitamin C to interact with E-cadherin at tight junctions can be observed from the interaction energy values. This research aims to determine the interaction energy produced when chitosan, ADTC5 and vitamin C interact with E-cadherin using molecular docking, sequential docking and molecular dynamics simulation methods. The results showed that the interaction energy of the E-cadherin EC1-EC2 domain complex with chitosan, ADTC5, and vitamin C was -30.12, -24.69, and -21.34 kJ/mol. Molecular dynamics simulations observe conformational changes that affect the resulting binding free energy, RMSD, and total potential energy.

Keywords: Intermolecular interactions, blood-brain barrier, drug delivery system, molecular docking, sequential docking, molecular dynamics simulation.

Presenter: Tita Pratama Annissa (titapratamaannissa@students.undip.ac.id)

Analyzing Students' Science Generic Skill of UIN Walisongo Using Rasch Model

Mar'attus Solihah | Mohammad Agus Prayitno

UIN Walisongo | UIN Walisongo

Abstract

Entering the 21st century, educational world is facing increasingly complex and dynamic challenges that require students to have high levels of adaptability and flexibility. It is necessary for students to gain basic skills so that they will be able to survive and adapt to the rapid changes in the field of work. These fundamental skills are known as generic skills, which in the science domain are specifically referred to as science generic skills. It is important to measure these skills so that students can know the level of mastery of these basic skills which can be used as a consideration for subsequent treatment. This study was aimed to analyze the generic science skills of UIN Walisongo students using Rasch model. To fulfill this objective students were given a multiple choice test with 45 items representing 4 science generic skills indicators that is symbolic language, logical inference, awareness of scale, and modeling. A total of 56 third semester students who was taking basic chemistry courses participated in this research. Based on analysis using Rasch model, it was found that the test had a special reliability of 0.94. The average generic science ability of students is 49.17% with the highest score being 73.33% and the lowest score being 22.22%. Further data regarding students' generic science abilities will be discussed in the article.

Keywords: science generic skill, rasch, rasch model

Presenter: Mar'attus Solihah (mar_attussolihah@walisongo.ac.id)

Poly_165

Cationic Dye Separator Based On 2,2,6,6-Tetramethylpiperidine-1-Oxyl(Tempo) Oxidized Cellulose

Jonathan M.Siagian

Program Studi Kimia, Fakultas Sains, Institut Teknologi Sumatera

Abstract

Cellulose is a potential alternative adsorbent but has limitations in color adsorption due to its inability to selectively adsorb specific dye groups. To overcome this, surface modification is necessary. This study aims to synthesize a negatively charged cellulose surface by modifying it with TEMPO/NaOCl/NaBr. Two concentrations of NaOCl were used in the process, specifically 5 mmol/g and 30 mmol/g. The carboxyl group content in the resulting TEMPO/NaOCl/NaBr-oxidized cellulose samples was measured at 0.5160 mmol/g and 1.8461 mmol/g, respectively. A separation test was conducted to evaluate the adsorption of cationic and anionic dyes using methylene blue and Remazol Yellow FG as test dyes. The adsorption capacity for methylene blue was found to be 78.17% ± 0.671 for the 30 mmol/g NaOCl-oxidized cellulose, 76.07% ± 2.934 for the 5 mmol/g NaOCl-oxidized cellulose, and 61.27% ± 0.954 for unmodified cellulose. These results demonstrate that TEMPO/NaOCl/NaBr-oxidized cellulose is effective in separating mixtures of cationic and anionic dyes.

Keywords: Adsorption, Cellulose, Methylene blue, Remazol yellow.s

Presenter: Jonathan M Siagian (jonathan.122270076@student.itera.ac.id)

Materials Chemistry_36

Characteristic, Bioactivity, and Application of Chitosan-Starch Edible Film with Added Essential Oil in Food Preservation

Sabella Vegasty | Triana Kusumaningsih | Maulidan Firdaus

Universitas Sebelas Maret | Universitas Sebelas Maret | Universitas Sebelas Maret

Abstract

Research related to chitosan edible film has been widely developed over the past few years. Chitosan edible film is an environmentally friendly alternative to food packaging. Chitosan can form intermolecular bonds with starch, which helps improve the structure and physical properties of the film, increases gloss, transparency, antibacterial activity, and reduces the wetness of the coating mixture. The combination of chitosan-cassava starch biofilm is a strong candidate for food coating and packaging. The mix of both is still hydrophilic, so the mechanical stability, water resistance, and moisture protection are still far from ideal standards. The addition of essential oils can increase tensile strength, elongation, and strengthen the polymer matrix between chitosan-starch also has the potential to increase bioactivity in edible films. This review focuses on (1) The effect of essential oil combination on the physical, chemical, thermal, and mechanical characteristics of chitosan/starch edible films and (2) Discussion of the bioactivity of chitosan/starch/essential oil edible films on various microorganisms in food (3) Application of edible chitosan/starch/essential oil films on food products.

Keywords: bioactivity, chitosan, edible film, essential oils, starch

Presenter: Sabella Vegasty (sabellavegasty@student.uns.ac.id)

Improving the Usefulness of Renewable Langmuir Adsorption Isotherm Equation for the Study of Adsorption Phenomena

Patiha | Maulidan Firdaus

FMIPA UNS (Retired) | FMIPA UNS

Abstract

There are misconceptions in the formula derivation and application of the Langmuir Adsorption Isotherm, LAI, equation. The derivation is based on the assumption that adsorption is a reversible process but the back-ward reaction is independent of concentration. The main equation and its linear form cannot be used to determine k because if v = Kads then k = 0. The equation is very similar to that for enzymatic reaction. Because the formula is a fraction with addition of terms in the denominator, to ensure the validity of the data for LAI determination technique, the Rate-law Separation Method (RlSM) must be used; data is divided into 2 parts; 3 outset and 3 near-end. The aims of this basic study are to obtain the LAI formula using a real reversible process and provide a technique for its application, as well as developing a concept similar to the Michaelis-Menten (KM) constant. The LAI formula based on a true reversible reaction and can be used to determine Kads (without making k value become zero), the adsorption mechanism and proof of its validity, as well as the concept of KP-M have been introduced.

Keywords: LAI; reversible; RlSM; Michaelis-Menten; KP-M.

Presenter: Patiha (patiha31@yahoo.co.id)

Parallel D

Moderator: Anung Riapanitra, PhD

Room: 5th floor Room 1

No	Time	Name	Afiliation	Title
1	**13:55 - 14:07**	**Uyi Sulaeman**	**UNSOED**	**Design of defective Ag_3PO_4 photocatalyst for enhanced photocatalytic activity**
2	14:09 - 14:46	Komang Diamantiarani Karyasa	UNDIP	Optimization of Methylene Blue Decolorisation Conditions via Photo Fenton Process Catalyzed Fe_3O_4-Zeolite Composite based on Response Surface Methodology
3	14:09 - 14:46	Husna Habib Musthofa	UNS	Chitosan-Modified Nanostructured Lipid Carriers from Rice Snail Shells as Controlled and Targeted Delivery Systems for Curcumin to Breast Cancer Cells
4	14:09 - 14:46	Alyssa Nur Syadiyah	UNDIP	Synthesis and Characterization of NiO-TiO_2/g-C_3N_4 and Its Application as a Photocatalyst in the Synthesis of Ethyl 2-Amminothiazole 5-Carboxylate
5	14:09 - 14:46	Anung Riapanitra	UNSOED	Hydrothermal Synthesis of $BiVO_4$/CNC Composite as Photocatalyst for the Removal of Tetracycline
6	14:48 - 15:25	Alya Dwi Arianty	UNIMUS	Case Study Of Testing Fluoide Levels In Drinking Water Using The Spadns Uv-Vis Spectrophotometer Method
7	14:48 - 15:25	Margareta N. Cahyanti	UKSW	Exploring the potential of palm oil biomass for biochar production to provide renewable energy.
8	14:48 - 15:25	Talitha Fitra Firdhausya	ITS	Synthesis of 2-Hydroxyethyl Esters from Waste Cooking Oil using Ethylene Glycol and K2CO3 Catalyst as Lubrication Bio-Additive for Low-Sulfur Fossil Diesel
9	14:48 - 15:25	Asiva Khoirunisa	UNIMUS	Analysis Of NaCl Levels In Broiler Chicken Using Mohr's Argentometry Method

Materials Chemistry_79

Design of defective Ag_3PO_4 photocatalyst for enhanced photocatalytic activity

Uyi Sulaeman | Rini Larasati | Dea Ajeng Rahma Winarto Putri | Dadan Hermawan | Ari Asnani | Isnaeni Isnaeni | Shu Yin

Jenderal Soedirman University | Tohoku University | Jenderal Soedirman University | Jenderal Soedirman University | Jenderal Soedirman University | National Research and Innovation Agency | Tohoku University

Abstract

The Ag3PO4 photocatalyst was developed to eliminate organic pollutants because of its highly active response under visible light irradiation. The properties of Ag3PO4 can be influenced by the preparation method. Starting materials and coprecipitation conditions can cause defects in Ag3PO4. The formation of defective Ag3PO4 can lead to increased photocatalytic activity. Here, defective Ag3PO4 photocatalysts can be designed through the coprecipitation method under Nigella sativa seeds aqueous extract (NSE) with the starting material of AgNO3 and Na2HPO4.12H2O. The mixture of Na2HPO4.12H2O solution and NSE was added with AgNO3 solution (dropwise) followed by aging treatment for 20 h. The results revealed that NSE causes significant changes in the absorption spectra, bandgap energy, Raman spectra, and P/Ag atomic ratio of Ag3PO4. This phenomenon suggests that the defective Ag3PO4 was easily produced. The highest photocatalytic activity of NSE-prepared Ag3PO4 for RhB degradation increased 11 times higher than that of samples without NSE. This excellent photocatalytic activity is mainly due to a higher activity of holes in the VB. These results are related to the research article “Design of defective silver phosphate photocatalyst using Nigella sativa seed aqueous extract for enhanced photocatalytic activity” (Sulaeman et al., Inorg. Chem. Commun. 163 (2024) 112368).

Keywords: Defective Ag3PO4, photocatalyst, Nigella sativa, band gap energy

Presenter: Uyi Sulaeman (sulaeman@unsoed.ac.id)

Catalyst_91

Optimization of Methylene Blue Decolorisation Conditions via Photo Fenton Process Catalyzed Fe3O4-Zeolite Composite based on Response Surface Methodology

Komang Diamantiarani Karyasa

Diponegoro University

Abstract

The Fenton process was introduced and used effectively to reduce organic compounds, including dyes, from industrial waste.Fe3O4-zeolite composite performance and durability as Fenton catalyst to decolorizing methylene blue, were evaluated using response surface methodology (RSM) with three variables including catalyst doses, H2O2 concentrations and pH. Zeolite was synthesized via the sol-gel method while its composite was synthesized via coprecipitation. The catalysts were characterized with XRD, SEM-EDX, SAA, DRS-UV and FTIR. Based on ANOVA analysis, the proposed RSM design adopting a quadratic model with R2 0,96 and R2pred 0,94 shows that the design allows a good prediction between variable ranges with pH, catalyst concentrations and interactions between catalyst and H2O2 concentrations significantly affect the responses. The degradation kinetics of methylene blue via photo-Fenton reaction agreed with the BMG (Behnajady-Modirshahla-Ghanbary) model. Composite has a good reusability with only a 4% decrease in decolorisation after five cycles. However, based on FTIR results, it noted that there is structural change after the reusability test, making the composite better for repeated use with regular replacement.

Keywords: Optimization, RSM, Fenton, Fe3O4, Zeolite

Presenter: Komang Diamantiarani Karyasa (ranikaryasa@students.undip.ac.id)

Medicinal Chemistry_59

Chitosan-Modified Nanostructured Lipid Carriers from Rice Snail Shells as Controlled and Targeted Delivery Systems for Curcumin to Breast Cancer Cells

Husna Habib Musthofa

Sebelas Maret University

Abstract

Current breast cancer treatments still rely heavily on chemotherapy, which has both physical and psychological side effects. Curcumin is easily degraded and has low bioavailability. As a lipophilic material, curcumin's stability can be enhanced using a drug delivery system based on chitosan-modified Nanostructured Lipid Carriers (NLCs) to protect the material from degradation in oral systems. Folic acid is also employed for targeting T47D breast cancer cells. Chitosan was synthesized from rice snail shells, yielding a white powder (32.28% yield) with a 95.46% degree of deacetylation, confirmed through functional group and diffraction analyses. The chitosan was conjugated with folic acid (Chi-FA). Curcumin-loaded NLCs were synthesized through an emulsion-evaporation-solidification reaction. The Cur@NLCs material exhibited two matrix models based on transmittance tests, with a particle size distribution of 174.4 nm and a zeta potential of -56.9 mV. Surface modification of Cur@NLCs with Chi-FA resulted in a particle size of 105.59 nm and a zeta potential of -45.9 mV. Release studies demonstrated that the presence of chitosan could suppress curcumin release in PBS at pH 1.2 (1.2-1.4%) and pH 7.4, while enhancing the release rate at pH 6.8. These findings indicate that the modifications can effectively control drug release and target cancer cells.

Keywords: breast cancer, rice snails, chitosan, NLCs, drug delivery

Presenter: Husna Habib Musthofa (husnahabibmstofa@student.uns.ac.id)

Catalyst_98

Synthesis and Characterization of NiO-TiO_2/g-C_3N_4 and Its Application as a Photocatalyst in the Synthesis of Ethyl 2-Amminothiazole 5-Carboxylate

Alyssa Nur Syadiyah

Diponegoro University

Abstract

Thiazole derivatives, a class of N-heterocyclic compounds, exhibit a wide range of structures and properties, which makes them important in various fields such as biochemistry, cell biology, genetics, pharmacology, and pharmacy. Due to their bioactivity including antihypertensive, antimicrobial, anticancer, antiviral, antidiabetic, and anti-inflammatory properties, these compounds play a crucial role in the synthesis of pharmaceuticals and other medically important substances. In this research, we utilized a hydrothermal method to synthesize the photocatalyst NiO-TiO2/g-C3N4 and applied it in the production of Ethyl 2-aminothiazole 5-carboxylate. The synthesis process involved heating melamine to obtain g-C3N4, and subsequently combining it with titanium (IV) isopropoxide and nickel acetate under controlled conditions. The efficiency of the photocatalyst was tested using ethyl acetoacetate and thiourea as precursors. Analysis of the synthesized photocatalyst indicated consistent physicochemical and structural properties. The NiO-TiO2/g-C3N4 demonstrated enhanced photocatalytic activity by effectively separating photogenerated electron-hole pairs. When applied in organic synthesis, this catalyst exhibited high product yields and selectivity under LED irradiation. In summary, the NiO-TiO2/g-C3N4 photocatalyst is efficient for organic synthesis, thus contributing to the advancement of new methodologies for producing medically significant thiazole derivatives.

Keywords: Photocatalytic Activity, NiO-TiO2/g-C3N4, Thiazole Derivatives, Hydrothermal Synthesis, Organic Synthesis

Presenter: Alyssa Nur Syadiyah (alyssanrsya@students.undip.ac.id)

Hydrothermal Synthesis of $BiVO_4$/CNC Composite as Photocatalyst for the Removal of Tetracycline

Anung Riapanitra | Sandrina Arie Maharani | Heroldinho Arieveali | Kapti Riyani | Niken Istikhari Muslihah | Tien Setyaningtyas

Jenderal Soedirman University | Jenderal Soedirman University | Jenderal Soedirman University | Jenderal Soedirman University | Jenderal Soedirman University | Jenderal Soedirman University

Abstract

Tetracycline is an antibiotic that, if released into the environment, will threaten the ecosystems and human health. To overcome this problem, this study offers a solution in the form of tetracycline antibiotic degradation carried out through photocatalytic methods using Cellulose Nanocrystal (CNC)/BiVO4 composites and under visible light irradiation. The CNC/BiVO4 composite is synthesized using the hydrothermal method. The material characterization of CNC/BiVO4 was performed using data observation from FTIR analysis, XRD, SEM image, and UV-Vis DRS. Based on the data, the hydrothermal process can synthesize CNC/BiVO4 with good crystallinity. The crystal structure of the CNC/BiVO4 8:1 mass variation is a tetragonal phase with a crystallite size of 46.38 nm. The functional groups in CNC/BiVO4 are O-H, C-H aliphatic, CH2 bond, C-O-C, V-O, and Bi-O, indicating the composite contains cellulose and BiVO4. The SEM image of CNC/BiVO4 showed hollow spheres-like morphology. The CNC/BiVO4 8:1 composite has the smallest band gap energy of 2.51 eV and has the best photocatalytic activity.

Keywords: bismuth vanadate, cellulose nanocrystalline, hydrothermal, tetracycline, photocatalyzed degradation

Presenter: Anung Riapanitra | Heroldinho Arieveali (anung.riapanitra@unsoed.ac.id | heroldinho.arieveali@mhs.unsoed.ac.id)

Materials Chemistry_137

Case Study Of Testing Fluoide Levels In Drinking Water Using The Spadns Uv-Vis Spectrophotometer Method

Salma Alifatun Nisa'[1] , Salma Salfiah[2] , Alya Dwi Arianty[3] , Fitria Fatichatul Hidayah[4]

Department of Chemistry Education, Faculty of Education and Humanities, Muhammadiyah University Semarang, Central Java 50273

*correspondence email : salmanisaa25@gmail.com

Abstract

Drinking water is consumed by the general public every day. One of the ingredients in drinking water is fluoride which can have a bad impact on humans if the level exceeds 1 mg/L. This research aims to determine fluoride levels in drinking water. Fluoride content analysis was carried out on 5 drinking water samples using a UV-Vis spectrophotometer at a wavelength of 570 nm with SPADNS reagent. The test is based on the reaction of fluoride and color absorption of zirconium which forms a colorless complex anion. The observation was carried out indirectly namely by observing the reduction in the absorption of the SPADNS-zirconyl acid reagent to which fluoride ions had been added. The measurement results show that the five samples have fluoride levels below 1 mg/L with an averae value ranging from 0,055 – 0,559 mg/L. according to SNI 01-3553-2006 Concerning Bottled Drinking Water, the drinking wate samples tested met the requirements because they did not exceed 1 mg/L.

Keywords: Drinking Water, Fluoride Levels, UV-Vis Spectrophotometer

Presenter: Alya Dwi Arianty (alyadwiarianty@gmail.com)

Green Chemistry_84

Exploring the potential of palm oil biomass for biochar production to provide renewable energy.

Margareta N. Cahyanti | Sri Hartini | Dewi K.A. Kusumahastuti

UKSW | UKSW | UKSW

Abstract

Zero waste manufacturing becomes more important as it plays a role in reaching the Sustainable Development Goals, particularly the 12th SDG, which focuses on responsible consumption and production. Indonesia is the world's largest producer of crude palm oil, producing more than 40 million metric tons each year. In addition to the significant production of crude palm oil, the coconut plantation industry generates more than 400 kilograms of solid waste in the form of empty fruit bunch, mesocarp fiber, and palm kernel shell. Solid waste could be used in biochar production. Biochar produced can be used as energy carrier. The aim of this study is to produce biochar from palm kernel shell and characterize the biochar as energy carrier. The palm kernel shell was carbonized at 300-500°C. To investigate the impact of carbonization in the structure of biomass molecules, FTIR experiments were performed. Additionally, elemental analyzers were used to examine the organic element of biomass. The results showed a shift in the molecular structure of biomass after carbonization, indicating the breakdown of the biomass fiber components. As the temperature of carbonization rises, the amount of carbon increases and the amount of oxygen drops. It implies that following the carbonization process, the quality of biomass as an energy carrier has been enhanced. These findings may provide a basis for future research regarding carbonization temperature and pretreatment for increased process efficiency.

Keywords: Bioenergy, biochar, energy carrier

Presenter: Margareta N. Cahyanti (margareta.cahyanti@uksw.edu)

Chemistry of Natural Products_80

Synthesis of 2-Hydroxyethyl Esters from Waste Cooking Oil using Ethylene Glycol and K2CO3 Catalyst as Lubrication Bio-Additive for Low-Sulfur Fossil Diesel

Talitha Fitra Firdhausya

Institut Teknologi Sepuluh Nopember

Abstract

Low-sulfur diesel fuel has low lubricity and is prone to cause engine wear. Lubricity-enhancing bio-additives are needed to improve the lubricity of low-sulfur diesel. 2-Hydroxyethyl ester (2-HEE) is one of the triglyceride-modified compounds that have the potential as a lubricity-enhancing bio-additive. The synthesis of 2-HEE based on waste cooking oil (WCO) containing triglyceride was carried out through two reaction stages, and the products were identified using a gas chromatography-mass spectrometer (GC-MS). The first reaction stage was the synthesis of Fatty Acid Methyl Esters (FAME) from WCO and methanol in a ratio of 1:6 and 1% w/w KOH through a transesterification reaction for 165 minutes at 65°C. The product yield is 82.72% and GC-MS relative abundance is 99.7% with 10 types of methyl esters formed. The second stage reaction is the synthesis of 2-HEE from FAME and ethylene glycol (EG) in a ratio of 2:1 and 1.2% K2CO3 w/w through a transesterification reaction for 180 minutes at 130°C. The conversion rate is 89,08% and a GC-MS relative abundance is 37.54% with 8 types of hydroxyethyl esters formed. This compound can be used as an alternative bio-additive to improve the lubrication of low-sulfur fossil diesel fuels.

Keywords: 2-Hydroxyethyl Esters, Waste Cooking Oil, Transesterification

Presenter: Talitha Fitra Firdhausya (talithafitra@gmail.com)

Materials Chemistry_140

Analysis Of NaCl Levels In Broiler Chicken Using Mohr's Argentometry Method

Muhammad Firman Maulana Arbi | Adhelia Rahma Sari | Asiva Khoirunisa | Yusrin

Universitas Muhammadiyah Semarang

Abstract

Consumption of broiler chickens in the community always increases every year. Broiler chicken has quite complete nutritional content, one of which is sodium. This study aims to determine NaCl levels in seasoned chicken samples using the Mohr's argentometry method. This concentration was determined using a standard AgNO3 solution by adding 5% K2CrO4 indicator then titrating until a brick red precipitate was formed. The samples used were 9 seasoned broiler chickens coded 329-338 taken from several places. Of all the samples studied, the highest and lowest NaCl levels were sample 331 with a level of 0.96% and 334 with a level of 0.47%, respectively. Quality control testing used duplo titration on sample code 329 as accuracy and obtained a %RPD of 1.7% so it can be said to meet the quality control requirements (SNI 01-2892-1992 concerning Methods for Testing Food and Beverages).

Keywords: Broiler chicken, the levels of NaCl, Mohr's method

Presenter: Asiva Khoirunisa (asivakhoirunisa90@gmail.com)

Parallel E

Moderator: Mohammad Alauhdin, S.Si., M.Si., Ph.D.

Room: 5th floor Room 2

No	Time	Name	Afiliation	Title
1	**13:55 - 14:07**	**Marcelinus Christwardana**	**UNDIP**	**Acetic Acid-Induced Neutralization and Its Effect on Electron Transfer in Halophilic Bacteria Bacillus clausii J1G-0%B**
2	14:09 - 14:46	Moch.Chasani	UNSOED	Formulation and Antioxidant Test of Nano Facial Wash Bay Leaf Extract with Active Ingredients Surfactant Methyl Ester Sulfonate from Ketapang Seed Oil
3	14:09 - 14:46	Fajar Hardoyono	UIN Prof. K.H. Saifuddin Zuhri	Identification of major volatile compounds in three different grades of commercial tea based on solid phase microextraction gas chromatography-mass spectrometry analysis
4	14:09 - 14:46	Dante Alighiri	UNNES	Isolation and Characterization of Flavonoid Compounds from Durian Fruit Peels (*Durio zibethinus*) and Their Antioxidant Activity Evaluation
5	14:09 - 14:46	Risna Ramadhani	UNS	New Method for Isolating Crotepoxide from the Rhizome of *Kaempferia rotunda*
6	14:48 - 15:25	Dante Alighiri	UNNES	Formulation and Characterization of Ant-Repellent Chalk from Active Compounds of Citronella Oil (*Cymbopogon winterianus*)
7	14:48 - 15:25	Ayuni Fitriyaningsih	UNS	Effect of Nickel(II) Modification on The Catalytic Performance of MOF UiO-67(Zr) In the Conversion of Ethyl Levulinate to ɣ-Valerolactone
8	14:48 - 15:25	Rachel Maulida Tsuraya	UNDIP	Synthesis of Complex Compounds of Schiff Base Ligands 2,4-dihydroxybenzaldehyde and 4-aminoantipyrine with the central metals Co(II), Ni(II) and Cu(II) as Antibacterials

Electrochemistry_74

Acetic Acid-Induced Neutralization and Its Effect on Electron Transfer in Halophilic Bacteria *Bacillus clausii* J1G-0%B

Marcelinus Christwardana

Department of Chemistry, Diponegoro University

Abstract

The optimal pH levels in halophilic microbial cultures are crucial, particularly following the introduction of acetic acid as a carbon source. This study evaluates the impact of the neutralization process on the extracellular electron transfer (EET) in Bacillus clausii cultures. By systematically examining various neutralization strategies, the research aims to identify conditions that optimize EET efficiency. The findings reveal that pH adjustments significantly influence the metabolic and redox activities of halophilic cultures. Cyclic voltammetry (CV) data indicate that control and neutralized cultures exhibit consistent electron transport mechanisms, characterized by distinct redox peaks and quasi-reversible processes. Unneutralized cultures display impaired electron transport and broader CV peaks, suggesting altered kinetics under acidic conditions. Laviron analysis corroborates these findings, showing a marked reduction in the electron transfer rate constant (k_s) for unneutralized cultures (0.08 s^{-1}) compared to both control (0.65 s^{-1}) and neutralized cultures (0.8 s^{-1}). These results underscore the detrimental effects of acidic environments on halophilic bacteria, likely due to stress and diminished metabolic activity, highlighting their preference for neutral to alkaline conditions. This study underscores the importance of maintaining appropriate pH levels in bioelectrochemical systems to ensure precise and reliable electrochemical measurements, particularly when utilizing pH-sensitive species such as halophilic bacteria.

Keywords: pH regulation, metabolism, Cyclic voltammetry, Extracellular electron transfer, Bioelectrochemical systems

Presenter: Marcelinus Christwardana (marcelinus@live.undip.ac.id)

Formulation and Antioxidant Test of Nano Facial Wash Bay Leaf Extract with Active Ingredients Surfactant Methyl Ester Sulfonate from Ketapang Seed Oil

Moch.Chasani | Senny Widyaningsih | Undri Rastuti | Vita Nuraisyah Dwi Nugroho

Universitas Jenderal Soedirman | Universitas Jenderal Soedirman | Universitas Jenderal Soedirman | Universitas Jenderal Soedirman

Abstract

The increasing use of skin care products today has encouraged the development of facial washes that are safe for health, such as the use of natural active ingredients. Surfactants from ketapang seed oil and bay leaf extract are natural ingredients for facial wash. This study aims to obtain the formulation and test the antioxidant activity of nano facial wash made from surfactants from ketapang seed oil and antioxidants from bay leaf extract. Changes in the molecular size of facial wash into nano facial wash are carried out using nanoemulsion technology. This change in particle size functions to optimize the delivery of active ingredients in facial wash. MES surfactant from ketapang seed oil is used to increase the stability and effectiveness of cleaning. The resulting product was tested for physical characteristics, stability, and antioxidant activity using the DPPH (1,1-diphenyl-2-picrylhydrazyl) method. The facial wash formulation was carried out with variations in MES concentration (3, 5, and 7%) and bay leaf extract (2, 4, and 6%). The results showed that the facial wash with the best characteristics was a facial wash with a surfactant content (MES) of 7% and bay leaf extract of 2%. The antioxidant activity of facial wash with the best nano and non-nano characteristics are 41.97 ppm and 81.58 ppm which is classified as strong antioxidant activity. The formulation of nano facial wash with surfactants from ketapang seed oil and bay leaf extract shows potential as a safe and environmentally friendly facial care product.

Keywords: Antioxidant, Ketapang, Nano facial wash, Surfactant

Presenter: Moch.Chasani | Senny Widyaningsih | Undri Rastuti | Vita Nuraisyah Dwi Nugroho (mochammad.chasani@unsoed.ac.id | senny.widyaningsih@unsoed.ac.id | undri.rastuti@unsoed.ac.id | vita.nugroho@mhs.unsoed.ac.id)

Chemistry of Natural Products_128

Identification of major volatile compounds in three different grades of commercial tea based on solid phase microextraction gas chromatography-mass spectrometry analysis

Fajar Hardoyono[1] | Kikin Windhani[2]

[1]Department of Environmental Sciences, Faculty of Science and Technology, Universitas Islam Negeri Profesor Kiai Haji Saifuddin Zuhri, Jalan A. Yani 40 A, Purwokerto, Central Jawa Indonesia. | [2]Agroeconomic Research Group, Department of Economic and Development Studies, Faculty of Economics and Business, Universitas Jenderal Soedirman Jalan HR. Bunyamin 708, Purwokerto, Central Java, Indonesia.

Abstract

This paper aims to analyse the composition of volatile organic compounds from 3 grades of commercial brewed tea from the Gopek Tea brand, including grade 1, grade 2, and grade 3. The solid phase microextraction gas chromatography-mass spectrometry (SPME-GC-MS) method was used to analyse the composition of volatile organic compounds in the three grades of tea. For the experiment, 10 mg of tea samples from each grade were put in a vial for 60 minutes of SPME-GC-MS analysis. The GC-MS chromatograms showed a different composition among grade 1, grade 2, and grade 3 tea samples. Grade 1 tea is dominated by benzyl acetate, linalool, and benzyl alcohol, with concentrations at 46%, 21%, and 8%, respectively. Grade 2 tea is dominated by the compounds (E)-Methyl isoeugenol, myristicine, and hexadecane with concentrations of 14%, 10%, and 10%, respectively. In comparison, grade 3 tea is dominated by benzyl alcohol and linalool with a concentration of 34% and 20%. The results of volatile compound identification in three grades of tea show that fragrance enhancer compounds dominate grade 1 and grade 3 teas. At the same time, grade 2 tea is more dominated by bioactive compounds and has fewer fragrance enhancer compounds than grade 1 and grade 3 tea.

Keywords: volatile compounds, SPME-GC-MS, tea

Presenter: Fajar Hardoyono (hardoyono@uinsaizu.ac.id)

Chemistry of Natural Products_143

Isolation and Characterization of Flavonoid Compounds from Durian Fruit Peels (*Durio zibethinus*) and Their Antioxidant Activity Evaluation

Dante Alighiri | Masturi | Rohmatullah Zakiyatul Maghfiroh | Apriliana Drastisianti | Samuel Budi Wardhana Kusuma | Tri Minarsih | Nanik Wijayati

Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia | Physics Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia | Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia | Department of Chemistry Education, Faculty of Sciences and Technology, Universitas Islam Negeri Walisongo Semarang, 50185 Central Java, Indonesia | Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia | Pharmacy Department, Faculty of Medicine, Universitas Negeri Semarang, 50237 Central Java, Indonesia | Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia

Abstract

Durian (Durio zibethinus Rumph. ex Murray) fruit peels are rich in flavonoids, which have significant potential as antioxidants. This study aims to isolate flavonoid compounds from durian fruit peels and evaluate their antioxidant activity. The extraction was optimized using a reflux method for 6 hours with 96% ethanol as the solvent, yielding the highest total phenolic content of 20.122 mg GAE/g sample and a total flavonoid content of 1.432 mg QE/g sample. Thin-layer chromatography (TLC) optimization was performed prior to isolation, with the best eluent system identified as chloroform (19:1), producing 10 distinct spots with Rf values ranging from 0.2 to 0.9 cm under UV light at 365 nm. Flavonoid isolation was conducted using column chromatography with silica gel GF60 as the stationary phase and chloroform (19:1) as the eluent. The isolation process resulted in three major fractions with Rf values of 0.824, 0.14294, and 0.1412 cm, respectively. FTIR and HPLC characterized these fractions. FTIR analysis confirmed the presence of flavonoid compounds, indicated by functional groups such as O-H, aliphatic C-H, aromatic C=C, C-O, C=O, and aromatic C-H. HPLC analysis revealed quercetin content in fractions 4, 5, and 6 at 11.602, 4.485, and 1.361 ppm, respectively. Antioxidant activity was assessed using the DPPH method, with fraction 4 exhibiting strong antioxidant activity at 97.30 µg/mL, while fractions 5 and 6 displayed moderate antioxidant activities at 119.20 µg/mL and 103.11 µg/mL, respectively. These findings suggest that durian fruit peels are a promising source of natural antioxidants, particularly flavonoids.

Keywords: durian, flavonoid, antioxidant, total phenolic content, total flavonoid content

Presenter: Dante Alighiri (dante_alighiri@mail.unnes.ac.id)

Chemistry of Natural Products_30

New Method for Isolating Crotepoxide from the Rhizome of *Kaempferia rotunda*

Risna Ramadhani, Soerya Dewi Marliyana, Muhammad Widyo Wartono

Universitas Sebelas Maret

Abstract

Kaempferia rotunda, commonly known as Kunci Pepet, is a Southeast Asian plant. Among its various compounds, crotepoxide stands out as the primary secondary metabolite found in its rhizome, classified under polyoxygenated cyclohexanes. This compound has demonstrated various bioactivities, including antibacterial, antileshmanial, and antimutagenic effects, and shows significant promise as an antitumor agent. The potential therapeutic applications of crotepoxide, highlighting the importance of K. rotunda in traditional medicine and modern pharmacology. Previous studies on the isolation of crotepoxide have often employed lengthy purification processes, resulting in low yields. This research aims to simplify the isolation of crotepoxide from K. rotunda rhizomes, thereby enhancing the yield. The successful extraction was achieved through a maceration technique using acetone as the solvent, followed by purification via recrystallization and monitoring through thin-layer chromatography, yielding 3.816 grams of crotepoxide. The identification of the compound was confirmed through FTIR and 1D-NMR (^{1}H-NMR and ^{13}C-NMR) analyses.

Keywords: crotepoxide, Kaempferia rotunda, isolation, recrystallization

Presenter: Risna Ramadhani (risnaramadhani5@student.uns.ac.id)

Formulation and Characterization of Ant-Repellent Chalk from Active Compounds of Citronella Oil (*Cymbopogon winterianus*)

Dante Alighiri | Ravely Adhitya Abdullah | Nanik Wijayati | Naufaldi Bani Widodo | Apriliana Drastisianti | Indah Putri Firnanda

Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia | Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia | Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia | Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia | Department of Chemistry Education, Faculty of Sciences and Technology, Universitas Islam Negeri Walisongo Semarang, 50185 Central Java, Indonesia | Chemistry Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, 50229 Central Java, Indonesia

Abstract

The widespread use of household insecticides in Indonesia poses significant health and environmental risks, mainly due to the chemical substances they contain. Ant-repellent chalk, commonly used to control insect populations, typically incorporates cypermethrin as an active ingredient. However, cypermethrin exposure can lead to severe adverse effects, including digestive disorders, reproductive issues, kidney damage, and liver failure, especially when accidentally ingested. This study explores an alternative approach by formulating ant-repellent chalk using natural active compounds derived from citronella essential oil (*Cymbopogon winterianus*), which presents a safer and environmentally friendly solution. The research involved the distillation of citronella oil to isolate its active components, the determination of their Minimum Inhibitory Concentration (MIC) values, and the subsequent formulation of ant-repellent chalk. Fractional distillation of citronella oil yielded three primary fractions: citronellal (33.2%), citronellol (12%), and geraniol (20%). These fractions were then evaluated for their ant-repellent activity, with MIC values determined as 0.75% for citronellal and citronellol, 1.00% for citronella oil, and 0.50% for geraniol. The formulated ant-repellent chalk, incorporating these active compounds, demonstrated high repellency rates of 93.3% for citronella oil, 91.6% for citronellal, 95% for citronellol, and 98.3% for geraniol. These findings suggest that citronella oil and its components can effectively replace harmful chemical insecticides in ant-repellent chalk, offering a promising natural alternative with reduced health and environmental risks.

Keywords: Insecticide, citronella, ant-repellent chalk, cypermethrin

Presenter: Dante Alighiri (dante_alighiri@mail.unnes.ac.id)

Catalyst_48

Effect of Nickel(II) Modification on The Catalytic Performance of MOF UiO-67(Zr) In the Conversion of Ethyl Levulinate to ɣ-Valerolactone

Ayuni Fitriyaningsih

Universitas Sebelas Maret

Abstract

The presence of catalysts is crucial for converting biomass into high-value chemicals. One promising catalyst is Metal-Organic Frameworks (MOFs). This study aims to investigate the effect of Ni(II) metal ion loading on the UiO-67(Zr) and its catalyst application in the catalytic transfer hydrogenation (CTH) of ethyl levulinate (EL). UiO-67(Zr) was synthesized via a solvothermal method at 140 °C for 15 hours. Ni(II) metal ion loading used the wet impregnation method with metal contents of 3.0%, 5.0% and 10.0% by weight. Catalytic testing of the CTH of EL was conducted at 180 °C for 3 hours under 5 bar of N2 gas pressure. The XRD results showed that the main peaks of UiO-67(Zr) and Ni(II)/UiO-67(Zr) matched standard peaks (CCDC No.2179856 and ICSD No.1100349). FTIR results indicated peak broadening at wave numbers 769.654, and 445 cm^{-1} for UiO-67, suggesting the formation of Zr-O bonds without new absorptions from Ni(II) ions. FESEM-EDX analysis revealed an irregular morphology of UiO-67(Zr) and agglomeration of Ni(II)/UiO-67(Zr) with increasing Ni(II) weight percentage. Surface area analysis indicated that Ni(II) impregnation reduced the surface area and pore volume. TEM analysis demonstrated the distribution of Ni(II) ions on the surface of UiO-67. TG/DTA analysis showed material stability up to 500 °C with increased residue as the Ni(II) weight percentage increased. Catalytic testing of the CTH of EL into γ-valerolactone showed that the presence of Ni(II) ions on the MOF enhanced GVL selectivity. The respective selectivity values were 83.4%, 90.9%, 91.6% and 96.7% for UiO-67(Zr), 3%Ni(II)/UiO-67(Zr), 5%Ni(II)/UiO-67(Zr), and 10%Ni(II)/UiO-67(Zr) catalysts.

Keywords: Catalytic transfer hydrogenation (CTH), Ethyl Levulinate (EL), γ-valerolactone (GVL), Ni(II)/UiO-67(Zr), UiO-67(Zr).

Presenter: Ayuni Fitriyaningsih (ayunifitriyani1604@student.uns.ac.id)

Medicinal Chemistry_97

Synthesis of Complex Compounds of Schiff Base Ligands 2,4-dihydroxybenzaldehyde and 4-aminoantipyrine with the central metals Co(II), Ni(II) and Cu(II) as Antibacterials

Rachel Maulida Tsuraya

Diponegoro University

Abstract

Schiff bases coordinate with transition metals to form chelate rings to enhance their antibacterial bioactivity. Schiff bases used because of their strong chelating affinity for metal ions and their ability to form stable complexes through donor atoms. This study aims to determine effect of donor atoms and metal coordination numbers on antibacterial activity. Schiff base ligand DBAP was synthesized from 4-aminoantipyrine and 2,4-dihydroxybenzaldehyde, while its complex was synthesized using Co(II), Ni(II), and Cu(II) metals. Characterization using UV-Vis spectrophotometry, Fourier Transform Infrared (FTIR), Magnetic Susceptibility Balance (MSB), and elemental analysis. The antibacterial activity of Schiff bases and all complex was evaluated against Escherichia coli and Staphylococcus aureus using well diffusion method. The FTIR spectrum showed successful synthesis of DBAP in the presence of azomethine groups, and structure of ligand was confirmed by NMR spectrum. All complexes were successfully synthesized with presence of d-d transitions in the UV-Vis spectrum. The results of MSB showed all complexes had octahedral geometry, and results of elemental analysis showed all complexes had molecular formula C20H23MN3O7 (M=Co(II); Ni(II); Co(II)). Antibacterial tests showed the complex had better antibacterial bioactivity than the ligand. The antibacterial activity of Co(II) complex was the highest than Ni(II) and Cu(II) complexes.

Keywords: Schiff base, Metal chelates, Complex, Antimicrobial activity

Presenter: Rachel Maulida Tsuraya (rachelmaulidatsuraya@students.undip.ac.id)

Parallel F

Moderator: Fitria Fatichatul Hidayah, S.Si., M.Pd

Room: 8th floor meeting room

No	Time	Presenter	Afiliation	Title
1	**13:55 - 14:07**	**Yuniawan Hidayat**	**UNS**	**Modifying Graphene's Electronic Properties through Doping and Defects: A DFTB Study**
2	14:09 - 14:46	Muhammad Bahrul Abid	UNDIP	Effects of Concentration on the Urea and Creatinine Self-Diffusion Coefficients in the Water: Molecular Dynamic Study
3	14:09 - 14:46	Sahri Tarigan	Institut Teknologi Sumatera	Development of a Silk Fiber/Bombyx mori-Carrageenan Composite Scaffold for Coronary Artery Vessel Applications Using Casting Technique
4	14:09 - 14:46	Renaldi Malay	Institut Teknologi Sumatera	Antibacterial Composite Film Based On Silk Fibroin/Hidroxypropyl Methylcellulose With Integrated Curcumin Extract
5	14:09 - 14:46	November Rianto Aminu	UKSW	Optimizing Modified Condensed Tannins for Copper Adsorption Using Density Functional Theory (DFT): A Computational Chemistry Approach
6	14:48 - 15:25	Parsaoran Siahaan	UNDIP	Adsorption of Water on (100), (110), and (111) NaCl Surfaces: A Theoretical Study
7	14:48 - 15:25	Rahmanto Aryabraga Rusdipoetra	UNAIR	Enhanced Scavenging Reactivity of Lignin Depolymerization Products Against Reactive Nitrogen Species: A DFT-Based Study on the Role of Allylic Conjugation

Computational Chemistry_64

Modifying Graphene's Electronic Properties through Doping and Defects: A DFTB Study

Yuniawan Hidayat

Universitas Sebelas Maret

Abstract

A comprehensive investigation using Density Functional Tight Binding (DFTB) calculations explored successfully the impacts of different dopants and defects on graphene's electronic properties. A supercell of 40 x 40 x 1 revealed that sulfur doping caused the Fermi level to shift from -4.67 eV to -3.57 eV and created a gap at the Dirac point between the valence and conduction bands, with K+ ions showing a preference for adsorption on sulfur-doped graphene. The study also examined the effects of divacancies and co-doping with nitrogen and sulfur on graphene, underscoring the importance of divacancies for band gap formation and increased density of states (DOS) intensity. Additionally, the electrical properties of graphene doped with graphite and N-pyridine were evaluated, revealing shifts in the Fermi level and increased electronic activity, with dopants broadening the bandgap and affecting K+ ion interactions. Furthermore, graphene defects were analyzed for hydrogen storage, showing that vacancies enhance hydrogen adsorption, with specific interaction energies calculated for different defect types. These results provide valuable insights into how doping and defects can be leveraged to modify graphene's electronic properties for various applications.

Keywords: DFTB, doped graphene, defect graphene, Electronic properties

Presenter: Yuniawan Hidayat (yuniawan.hidayat@mipa.uns.ac.id)

Computational Chemistry_3

Effects of Concentration on the Urea and Creatinine Self-Diffusion Coefficients in the Water: Molecular Dynamic Study

Muhammad Bahrul Abid | M Cholid Djunaidi | Dwi Hudiyanti | Parsaoran Siahaan*| Nurwarrohman Andre Sasongko | Aditya Wibawa Sakti

Department of Chemistry, Faculty of Sience and Mathematics, Diponegoro University | Department of Chemistry, Faculty of Sience and Mathematics, Diponegoro University | Department of Chemistry, Faculty of Sience and Mathematics, Diponegoro University | Department of Chemistry, Faculty of Sience and Mathematics, Diponegoro University | Department of Chemistry, Pukyong National University, Busan, Korea | Global Center for Science and Engineering, Waseda University, Japan

Abstract

Increased levels of urea and creatinine, known as uremia, are a common consequence of chronic kidney disease (CKD). Molecular dynamics simulations were used to calculate the effect of concentration on the diffusion coefficients of urea and creatinine at temperature 310.15K and pressure 1 bar to explain the phenomenon of uremia. Water, urea and creatinine molecules were calculated at the B3LYP/6-311G* level. GAFF is used to parameterize water, urea and creatinine compounds. Normal levels of urea in the blood are 1.8 – 7.1 mmol/L and creatinine are 45 – 106 µmol/dL (x = 0.05 – 0.35). Concentration variations consist of x = 0.01; 0.05; 0.10; 0.20, 0.30, and 0.40 to describe low, normal, and high concentrations. The diffusion coefficients of urea and creatinine calculated based on the Einstein-Stokes relation increase with increasing concentration. The radial distribution function shows the formation of more hydrogen bonds at higher concentrations.

Keywords: Uremia, Urea, Creatinine, Molecular Dynamic, Self-Diffusion Coefficient

Presenter: Muhammad Bahrul Abid (muhammadbahrulabid@students.undip.ac.id)

Poly_166

Development of a Silk Fiber/*Bombyx mori*-Carrageenan Composite Scaffold for Coronary Artery Vessel Applications Using Casting Technique

Sahri Tarigan, I Putu Mahendra

Program Studi Kimia, Fakultas Sains, Institut Teknologi Sumatera, Program Studi Kimia, Fakultas Sains, Institut Teknologi Sumatera

Abstract

Coronary artery disease is a leading cause of death in Indonesia, and one of the treatment options is bypass surgery. However, bypass surgery carries significant risks, including potential damage to the lymphatic system, nerves, and blood vessels. This study focuses on developing a scaffold made from a composite of Bombyx mori silk fiber and carrageenan for use in coronary artery vessels. Silk fibers were isolated from Bombyx mori cocoons through a degumming process using Na_2CO_3, followed by dissolution with LiBr, and then dialysis. The composite was created by varying the amount of silk fiber (0.04 g/mL) at volumes of 0, 5, 10, and 15 mL, combined with 3.0% (w/v) carrageenan. FTIR analysis indicated that the resulting composite was dominated by carrageenan peaks, attributed to its higher concentration. Surface morphology analysis showed variations in the composite's surface structure depending on the silk fiber concentration. The crystallinity index of the composites ranged from 80% to 73%. These findings suggest that the silk fiber/carrageenan composite exhibits high crystallinity, making it a promising candidate for scaffold development in coronary artery applications

Keywords: Coronary artery, Silk fiber, Carrageenan, Composites

Presenter: Sahri Tarigan (sahri.121270040@student.itera.ac.id)

Poly_167

Antibacterial Composite Film Based On Silk Fibroin/Hidroxypropyl Methylcellulose With Integrated Curcumin Extract

Renaldi Malay, I Putu Mahendra

Program Studi Kimia, Fakultas Sains, Institut Teknologi Sumatera, Program Studi Kimia, Fakultas Sains, Institut Teknologi Sumatera

Abstract

Skin grafting is a common medical procedure for burn wound healing, but it faces challenges such as limited donor availability and high costs. This research aims to develop an antibacterial composite film for tissue regeneration in burn wounds as an alternative. The film is composed of curcumin extract, combined with varying concentrations of silk fibers (0.07 g/mL) and HPMC (0.5%, w/v). The film was characterized using FTIR, XRD, and SEM, and its antibacterial activity was tested against S. aureus and E. coli. FTIR analysis revealed that the addition of curcumin did not introduce any new peaks. XRD analysis indicated that the film's structure was predominantly amorphous, attributed to the presence of silk fibroin. Surface morphology analysis showed that increasing the concentration of silk fibers resulted in a more homogeneous film, as evidenced by the disappearance of microdomains on the surface. The obtained film demonstrated significant antibacterial activity, with inhibition zones averaging 17 mm for S. aureus and 10 mm for E. coli. These results suggest that the composite film has considerable potential for medical applications due to its effective antibacterial properties.

Keywords: Composite film, HPMC, Curcumin, Silk fiber, Antibacterials

Presenter: Renaldi Malay (renaldi.121270036@student.itera.ac.id)

Optimizing Modified Condensed Tannins for Copper Adsorption Using Density Functional Theory (DFT): A Computational Chemistry Approach

November Rianto Aminu | Suryadi Joyopranoto | Margareta Novian Cahyanti | Parsaoraan Siahaan

Chemistry Department, Faculty of Science and Mathematics, Satya Wacana Christian University | Chemistry Department, Faculty of Science and Mathematics, Satya Wacana Christian University | Chemistry Department, Faculty of Science and Mathematics, Satya Wacana Christian University | Chemistry Department, Faculty of Science and Mathematics, Diponegoro University

Abstract

The effective design of modified condensed tannins for copper (Cu) adsorption is essential for improving environmental clean-up methods. In this study, Density Functional Theory (DFT) is used to compare the interaction energies between Cu ions and different modified condensed tannin structures. By making systematic changes to functional groups and molecular configurations, we have identified modifications that increase the stability of tannin-Cu complexes. The DFT calculations have provided detailed insights into the interaction energies, revealing the electronic and geometric factors that affect adsorption efficiency. Through comparing the interaction energies for various modifications, we have developed a computational framework for predicting and optimizing the performance of tannin-based adsorbents. This approach not only advances our understanding of tannin-Cu interactions, but also helps in creating more effective materials for water purification and heavy metal recovery. The results underscore the potential of computational chemistry in designing high-performance adsorbents through precise molecular modifications.

Keywords: Density Functional Theory; Interaction Energies; Modified Condensed Tannins; Copper Adsorption; Environmental Remidiation

Presenter: November Rianto Aminu (november.aminu@uksw.edu)

Computational Chemistry_123

Adsorption of Water on (100), (110), and (111) NaCl Surfaces: A Theoretical Study

Parsaoran Siahaan | Muhammad Bahrul Abid | Marcelinus Rangga Laksmana Yosardi | Dwi Hudiyanti | M Cholid Djunaidi | Nurwarrohman Andre Sasongko

Department of Chemistry, Faculty of Sience and Mathematics, Diponegoro University | Department of Chemistry, Faculty of Sience and Mathematics, Diponegoro University | Department of Chemistry, Faculty of Sience and Mathematics, Diponegoro University | Department of Chemistry, Faculty of Sience and Mathematics, Diponegoro University | Department of Chemistry, Faculty of Sience and Mathematics, Diponegoro University | Department of Chemistry, Pukyong University, Busan, Korea

Abstract

Using the first-principles calculations method based on density functional theory, the adsorption of water on (100), (110), and (111) NaCl surfaces have been investigated. According to the calculation results, the most stable conformation was H2O favorable to be adsorped on top of Na-site of (100) surface with interaction energy -0.393 eV. Moreover, Bader charges and density of states was calculated to explain the mechanism of adsorption.

Keywords: Adsorption, Water, NaCl, Surfaces, DFT

Presenter: Parsaoran Siahaan (siahaan.parsaoran@live.undip.ac.id)

Computational Chemistry_61

Enhanced Scavenging Reactivity of Lignin Depolymerization Products Against Reactive Nitrogen Species: A DFT-Based Study on the Role of Allylic Conjugation

Rahmanto Aryabraga Rusdipoetra | Hery Suwito | Ni Nyoman Tri Puspaningsih | Kautsar Ul Haq

a. Bioinformatic Research Group, Research Centre of Bio-Molecule Engineering (BIOME), Airlangga University, Jl. Ir. H. Soekarno Mulyorejo, Surabaya, Indonesia. b. Department of Chemistry, Faculty of Science and Technology, Airlangga University, Jl. Ir. H. Soekarno Mulyorejo, Surabaya, Indonesia. | b. Department of Chemistry, Faculty of Science and Technology, Airlangga University, Jl. Ir. H. Soekarno Mulyorejo, Surabaya, Indonesia. | b. Department of Chemistry, Faculty of Science and Technology, Airlangga University, Jl. Ir. H. Soekarno Mulyorejo, Surabaya, Indonesia. c. Proteomic Research Group, Research Centre of Bio-Molecule Engineering (BIOME), Airlangga University, Jl. Ir. H. Soekarno Mulyorejo, Surabaya, Indonesia. | a. Bioinformatic Research Group, Research Centre of Bio-Molecule Engineering (BIOME), Airlangga University, Jl. Ir. H. Soekarno Mulyorejo, Surabaya, Indonesia. b. Department of Chemistry, Faculty of Science and Technology, Airlangga University, Jl. Ir. H. Soekarno Mulyorejo, Surabaya, Indonesia.

Abstract

Apart from reactive oxygen species (ROS), reactive nitrogen species (RNS) have been shown to trigger various diseases such as diabetes and Alzheimer's. However, research on antioxidant compounds capable of scavenging these species is still limited, both in vitro and in silico. Our previous studies demonstrated that syringol derivatives from lignin depolymerization, namely syringol (Hs), 4-allylsyringol (HAs), 4-propenylsyringol (HPns), and 4-propylsyringol (HPs), exhibit potent activity in scavenging HOO• radicals. Therefore, this study aims to investigate the capability of these derivatives to scavenge RNS in both polar and non-polar environments. To achieve this, quantum mechanical methods based on density functional theory (DFT), following the QM-ORSA protocol, were used to analyze the possible scavenging mechanisms of the four syringol derivatives through thermodynamic and kinetic analysis. NO• and NOO• radicals were chosen as targets for research with careful consideration. Using this method, consistent with previous research, this study reveals a different conclusion: the additional conjugative effect provided by the allylic group enhances the scavenging reactivity of syringol derivatives against RNS in both polar and non-polar environments.

Keywords: Antioxidant, RNS, DFT, Lignin Depolymerization Product, QM-ORSA

Presenter: Rahmanto Aryabraga Rusdipoetra (aryabragarahmanto@gmail.com)

Parallel G

Moderator: Dr. Retno Ariadi Lusiana, M.Si

Room: 3rd floor Ballroom

No	Time	Presenter	Afiliation	Title
1	**13.55 - 14.07**	**Ervin Tri Suryandari**	**UIN Walisongo Semarang**	**Modification of PMMA Nanofibers Membrane Composites With Zeolite 4A And Its Properties**
2	14.09 - 14.46	Ninna Arifatun Nurul Azizah	UNS	Synthesis, Biological Evaluation and Characterization of Cu(II)-3-Picolylamine Complexes
3	14.09 - 14.46	Dini Deviana Saputri	UNS	The Development of Carbon Nanofibers (CNF) and Metal Oxide as Hybrid Filler for Electromagnetic Interference Shielding Composites
4	14.09 - 14.46	Balqis Salsabila Santoso	UNDIP	The Effect of Palmitic Acid Concentration on Hydrophobicity of Silica Thin Layer
5	14.09 - 14.46	Nadia Fauziah Hakim	UNDIP	Synthesis and Characterization of Graphene Oxide/Polyvinyl Alcohol with Various Dicarboxylic Acid Crosslinkers for Pervaporative Desalination
6	14.48 - 15.25	Putri Sholehah	UNS	Synthesis and Characterization of Cobalt (II) Complex with Nicotinic Acid Ligand
7	14.48 - 15.25	Dian Windy Dwiasi	UNSOED	Phenol Adsorption Using Ni/Al-Benzoate Hydrotalcite
8	14.48 - 15.25	Anida Salma	UNS	Polarizability of Boro Bismuth Glasses As Function of P_2O_5/ TeO_2 Ratio (F)
9	14.48 - 15.25	Retno Ariadi Lusiana	UNDIP	Synthesis and Characterization of Chitosan Thin Films Using Organic Acid Solvents

Nanomaterials_130

Modification of PMMA Nanofibers Membrane Composites With Zeolite 4A And Its Properties

Ervin Tri Suryandari

UIN Walisongo Semarang

Abstract

Nanofibers is the materials that has recently received a lot of attention because it has several advantages, its high surface area, superior mechanical performance, high porosity, light weight and high permeability. The simple way method to create nanofibers is electrospinning. Nanofiber modification is carried out by combining polymers with inorganic materials such as zeolite to to improve their properties and performance. The resulting nanofibers were characterized using FTIR, SEM, TEM, DTG and contact angle. PMMA-Zeolite composite nanofibers were successfully made by adding 40% optimum zeolite (PMMA-Zeolite composite nanofibers 40%). From the FTIR data shows new absorption peak at wave numbers 1149.57 and 754.17 cm-1 in the PMMA-Zeolite nanofiber spectrum which represents the Si-O and Al-O-Al bonds which are typical spectra of zeolite. From the SEM mapping image, it is evident that the zeolite has successfully spread evenly on the nanofiber surface, this is reinforced by the TEM data. From the DTG data the addition of zeolite to PMMA nanofiber will increase thermal stability and change the hydrophilicity, this can be seen from the decreasing contact angle of the nanofiber to water with increasing amount of zeolite, this is supported by the increasing hydration free energy (-ΔGSW) data, this indicates that the nanofiber surface is increasingly easy to interact with water and more stable.

Keywords: PMMA, Zeolit, Nanofibers membrane, Electrospinning

Presenter: Ervin Tri Suryandari (ervin_ts@walisongo.ac.id)

Materials Chemistry_14

Synthesis, Biological Evaluation and Characterization of Cu(II)-3-Picolylamine Complexes

Ninna Arifatun Nurul Azizah | Monica Hening Citra Dewi | Sentot Budi Rahardjo | Soerya Dewi Marliyana

Universitas Sebelas Maret | Universitas Sebelas Maret | Universitas Sebelas Maret | Universitas Sebelas Maret

Abstract

The study aims to synthesis, characterize in detail (UV-Vis Spectroscopy, Atomic Absorption Spectroscopy (AAS), FTIR, thermal analysis (TGA), molar conductivity measurements, and magnetic moment determination), and to determine the bacterial inhibition potential of the Cu(II)-(3-picolylamine) complex. The complex was synthesized by refluxing $CuSO_4 \cdot 5H_2O$ and 3-picolylamine in a respective molar ratio of metal to ligand of 1:4. The appearance of a dark blue precipitate (yield = 60.46%) and a shift in the maximum wavelength to a lower value indicated the formation of the complex. The FTIR spectra suggest that the specific -NH2 functional group of 3-picolylamine coordinated to the central ion of Cu(II). The complex is an electrolyte with SO_4^{2-} as the counter ion that exhibits paramagnetic properties with an effective magnetic moment (μeff) of 1.86 BM. The electronic spectra display a single absorption peak at 751 nm. The suggested geometry for the complex is square pyramid. Yet antibacterial activity tests of the Cu(II)-(3-picolylamine) complex against S. epidermidis ATCC 12228 and P. aeruginosa ATCC 27853 indicated the lack of antibacterial activity.

Keywords: synthesis complex, Cu(II) complex, 3- picolylamine, Antibacterial activity

Presenter: Ninna Arifatun Nurul Azizah (ninnaarifatunna@student.uns.ac.id)

Nanomaterials_148

The Development of Carbon Nanofibers (CNF) and Metal Oxide as Hybrid Filler for Electromagnetic Interference Shielding Composites

Dini Deviana Saputri | Teguh Endah Saraswati | Wijang Wisnu Raharjo

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Indonesia | Department of Mechanical Engineering, Faculty of Engineering, Sebelas Maret University, Indonesia

Abstract

In this modern era, humans cannot be separated from utilizing electronic devices. The unwanted noise or disturbance problem in electronic devices is majorly caused by Electromagnetic Interference (EMI). Recent technology and materials are being developed to manufacture EMI shielding composites. Carbon nanomaterial-based composites become very attractive material because of their lightweight, incredible mechanical, thermal, and conductivity properties. Carbon nanofibers (CNF) and metal oxides are promising combination materials that reveal unique properties of both components to enhance shielding effectiveness. This combination of CNF and metal oxides results in a synergistic effect, where the conductive CNF enhances the reflection of EMI, and the metal oxides contribute to the absorption and attenuation of the waves. In this review article, we put our attention to the extensive discussion about the using of carbon nanofibers and some variations of metal oxides as hybrid fillers for some polymers in EMI shielding applications. We also discussed the latest studies that develop the method to produce CNF-metal oxide hybrid filler composites, such as through microwave-assisted co-precipitation, electrospinning, and electrodeposition methods.

Keywords: Carbon Nanofibers, Metal Oxide, Hybrid Filler, EMI Shielding

Presenter: Dini Deviana Saputri (deviadini2409@student.uns.ac.id)

Materials Chemistry_93

The Effect of Palmitic Acid Concentration on Hydrophobicity of Silica Thin Layer

Balqis Salsabila Santoso

Diponegoro University

Abstract

This research studied the effect of palmitic acid concentration on the hydrophobicity of silica thin films made by the sol-gel method. In principle, TEOS is reacted with ethanol solvent with an acid-base catalyst to form a sol and reacted with palmitic acid using various concentrations then coated on the glass surface and heated at 50°C and 100°C. The obtained xerogel was characterized using FTIR to determine the characteristics of the functional groups contained in it. While the contact of the thin film on the glass was tested with water contact angle to observe its hydrophobic properties. The results obtained showed that the higher the concentration of palmitic acid in the silica thin film, the more hydrophobic it is. Where an increase in the water contact angle was obtained up to 130.9 ° C at a palmitic acid concentration of 7% w/v. FTIR characterization results showed the presence of Si-O-C, Si-O-Si, C = O, C-O, -OH, and C-H functional groups. From this characterization, changes in the functional group signal can be seen as the treatment temperature increases.

Keywords: silica thin layer, hydrophobic silica, palmitic acid

Presenter: Balqis Salsabila Santoso (balqisalsabilasan@students.undip.ac.id)

Materials Chemistry_102

Synthesis and Characterization of Graphene Oxide/Polyvinyl Alcohol with Various Dicarboxylic Acid Crosslinkers for Pervaporative Desalination

Nadia Fauziah Hakim

Diponegoro University

Abstract

Thin-film composited membranes on macroporous nylon substrates, graphene oxide (GO) sheets, and polyvinyl alcohol (PVA) crosslinked with various Dicarboxylic Acids have been successfully fabricated. This study aims to compare the performance of different Dicarboxylic Acids as crosslinkers in achieving the highest desalination efficiency, permeability, and membrane stability. Membrane performance in desalination applications was evaluated by measuring water flux and salt rejection over a 30-hour period. GO was successfully synthesized using a modified Hummers method, and the membranes were prepared via vacuum filtration with various dicarboxylic acid crosslinkers (malic acid, maleic acid, and oxalic acid). The c-GO/PVA membranes were characterized using X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), water contact angle, and scanning electron microscopy (SEM). Experimental results demonstrated that the addition of a crosslinker enhanced membrane stability, while PVA increased hydrophilicity. Desalination tests revealed that pure GO membranes exhibited high water flux but were susceptible to leakage and had the lowest salt rejection. The nylon GO/PVA c-Malic Acid membrane exhibited the best stability, achieving a water flux of 39.2727 kg m−2 h−1 and maintaining 100.0% salt rejection for 30 hours, making it a promising candidate for pervaporation applications.

Keywords: GO, PVA, Desalination, Dicarboxylic Acid, Crosslink

Presenter: Nadia Fauziah Hakim (nadiafauziahhakim@students.undip.ac.id)

Materials Chemistry_16

Synthesis and Characterization of Cobalt (II) Complex with Nicotinic Acid Ligand

Putri Sholehah | Anggela Anindita | Sentot Budi Rahardjo

Sebelas Maret University | Sebelas Maret University | Sebelas Maret University

Abstract

This study was aimed to synthesis and characterize of Cobalt(II) with nicotinic acid ligand to obtain cobalt(II) complex. The complex of cobalt(II) with nicotinic acid (asnt) was synthesized at a mole ratio of 1:2 in methanol. The complex was characterized by UV-Vis Spectrophotometer, Atomic Absorption Spectrophotometry (AAS), Differential Thermal Analyzer (DTA), conductivity, Fourier Transform Infrared Spectroscopy (FTIR), Magnetic Susceptibility Balance (MSB), and Powder X-ray Diffraction. The formula complex is [Co(asnt)3(H2O)3]Cl2.nH2O (n = 0, 1 or 2). Thermal analysis showed that the complex contained several hydrates. The results of the electrical conductivity showed that the charge of the cation: anion complex was 1 : 1 and it was an electrolyte. The infrared spectrum showed of the N-tertiary functional group coordinated on metal ion. The electronic spectra showed two peaks indicating the transitions 4T1g(F) → 4T1g(P) (ν3) and 4T1g(F) → 4A2g(F) (ν2). The complex is paramagnetic with □eff = 4.86-5.02 BM. The complex indicated an octahedral geometry. The crystal system of the Co(II)-asnt complex is monoclinic.

Keywords: Synthesis, Cobalt(II), Nicotinic Acid, Complex

Presenter: Putri Sholehah (putrisholehah3112@gmail.com)

Phenol Adsorption Using Ni/Al-Benzoate Hydrotalcite

Dian Windy Dwiasi, Annisa Salsabila

Jenderal Soedirman University

Abstract

Phenol is one of the compounds widely used by industries, such as gas, herbal medicine, pharmaceutical, and household industries. Phenol waste is dangerous because it can pollute the environment if it is disposed of directly without being processed first. One of the processing phenol methods that can be done is using adsorption method because it is easy to do. The absorbent material that can be used is hydrotalcite. Hydrotalcite is an anionic clay consisting a stack of positively charged layers and has anions between the layers. In this research, the adsorbent used is Ni/Al-Benzoate hydrotalcite. This research aims to determine the ability of Ni/Al-Benzoate hydrotalcite as an adsorbent in adsorbing phenol. Ni/Al-Benzoate hydrotalcite was successfully synthesized using the coprecipitation method with a Ni2+:Al3+ ratio of 3:1 and continued with a hydrothermal process at a temperature of 120 °C for 20 hours. The results of hydrotalcite synthesis were further characterized using FTIR and XRD. The results of FTIR analysis show a C=C peak at a wavelength of 1594 cm-1 indicating the presence of benzoate in the material. The results of XRD analysis show the highest diffraction peaks at angles of 6.0390°, 11.1835°, and 22.9300° with d-spacing values of 14.6355 Å, 7.9120Å, and 3.8786Å, respectively. Ni/Al-Benzoate material has optimal adsorption activity at a concentration of 20 ppm, with 120 minutes of contact time, and pH 4. The reduction in phenol concentration reached 71.31%, in accordance with the pseudo second order adsorption kinetics and has a maximum adsorption capacity of 15.1037 mg/g.

Keywords: hydrotalcite, benzoate, phenol, adsorption, adsorption kinetics

Presenter: Dian Windy Dwiasi,| Annisa Salsabila (dian.dwiasi@unsoed.ac.id)

Materials Chemistry_24

Polarizability of Boro Bismuth Glasses As Function of P_2O_5/ TeO_2 Ratio (F)

Anida Salma | Ahmad Marzuki | Harjana | Devara Ega Fausta | Ari Handono Ramelan | Artono Dwijo Sutomo | Hery Purwanto

Physics Department, Faculty Mathematics and Natural Science, Universitas Sebelas Maret Surakarta

Abstract

Boro bismuth glasses formulated as 45Bi2O3- 40B2O3 - (10-x)TeO2 - 5ZnO -xP2O5(BBTZP) where x = 0; 0.5; 1; 1.5; 2; 2.5; and 3 mol% were successfully synthesized at 950oC and followed by annealing process until cooled to the room temperature. Glass optical properties as a function of the P2O5/TeO2ratio (f) were investigated. To measure the glass refractive index, Brewster's angle principle was carried out by utilizing a rotating table, photodetector, and commercial diode laser with wavelength 632 nm as the light source at room temperature. At the same time, the empirical calculation to obtain refractive molar and electronic polarizability of glass was performed to complement the measurement result. The recorded refractive index of BBTZP glasses declined from (1.70 ± 0.03) to (1.58 ± 0.03). While, refractive molar and electronic polarizability range from 15.0 to 14.8 cm3/mol and 5.60 to 6.19 Å, respectively. From both results, it can be concluded that the ratio (f) increase led to the decrease in glass polarizability due to the lower ionic polarizability of P3+ ions compared to Te4+ ions that directly affect the glass optical properties.

Keywords: Boro bismuth glass, Brewster angle, electronic polarizability, refractive index, refractive molar

Presenter: Anida Salma (anida_salma3@student.uns.ac.id)

Polymer Chemistry_69

Synthesis and Characterization of Chitosan Thin Films Using Organic Acid Solvents

Retno Ariadi Lusiana

Universitas Diponegoro

Abstract

In general, chitosan solutions are made using acetic acid as a solvent. In this research, a chitosan solution was made with several organic solvents (carboxylic acids) such as formic acid, glycolic acid, lactic acid, malic acid, and citric acid as another option to replace the acetic acid solvent. Next, using the phase inversion method, the chitosan solution was printed into a thin film, and its characteristics were studied. The research was carried out in several stages: 1) preparation 0.1 M acid solutions; 2) dissolving chitosan in 0.1M carboxylate solution; 3) thin film printing, 4) physicochemical-biological characterization of the thin film. Based on the data, it was found that all carboxylic acids could effectively dissolve chitosan to replace acetic acid. In general, in all solvents the twin specific groups -OH and -NH_2 as a characteristic of chitosan appear with a clear spectrum, but are slightly shifted in malic acid and citric acid, which is possible because they contain more hydroxyl and carboxylate groups than the other acids, which causes direct interactions. strong with chitosan through hydrogen bonds and ionic interactions. Increasing the chitosan concentration makes the resulting thin film thicker and reduces the value of water absorption, porosity, hydrophilicity, thin film properties, and morphology. Based on the physical properties test, in general, the water absorption values, degree of expansion, and porosity, respectively from smallest to largest, are formic acid<acetic acid<lactic acid<glycolic acid<malic acid<citric acid. The order of thin film mechanical strength is as follows: acetic acid<formic acid<malic acid<lactic acid<glycolic acid<citric acid.

Keywords: chitosan, solvent, thin film, carboxylic acid

Presenter: Retno Ariadi Lusiana (retno.lusiana@live.undip.ac.id)

Poster

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P2	Rossa Amanda Putri	UII	Evaluation of Durian Seeds (Durio zibethinus) as a Natural Coagulant for Peat Water Treatment
P3	Megawati Mohd yunus	Universiti Sains Malaysia.	Synthesis, Structure Elucidation and Fire Retardancy of Hexasubstituted Cyclotriphospazane Derivatives with Hydrazine Bridge Linkages
P4	Oscar Oleta Palit	Kanazawa University	Theoretical Comparison of Stability between Carbon Monoxide (CO) and Oxygen (O2) in Hemoglobin Complex Using Molecular Dynamics Simulation and Binding Free Energy Calculation
P5	Cucun Alep Riyanto	UKSW	Effect of Reflux on Surface and Pore Characteristics of Rice Husk and Teak Sawdust Activated Carbon
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P7	Amri Abdulah	UNS	Comprehensive Investigation (SEM-EDX, TEM and XRD) of Silica for SiO2+EG/W Nanofluids
P8	Anggita Larasati	UNS	Synthesis and Characterization of Silver-Substituted Cobalt Ferrite Using Coprecipitation Method as Alternative Antioxidant Material
P9	Sri Hastuti	UNS	Synthesis of Magnetized and Functionalized Silica (Fe3O4@SiO2@meso-SiO2@TMPDT) for Adsorption of Metal Ion Cd(II)
P10	Ulfa Afrinurfadhilah Darojati	UNS	The Effect of Co-Processed Excipient and Manitol on Physical Properties and Release Test of Flavonoid Total of Bajakah Root (Spatholobus littoralis Hassk.) Water Extract of Effervescent Granule
P11	M. Nur Dewi Kartikasari	UNS	The Effect of Maltose-Sucrose on Physicochemical Properties of Bajakah Root Ethanolic Extract (Spatholobus littoralis Hassk.) Hard Lozenges, Release Test of Flavonoid Total and Sensory Test

Poster

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P13	Indra Surya	USU	The reinforcement effect of different concentration of silica from coal burning fly ash on styrene butadiene rubber
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P16	Nova Septi Widyaning Putri.	UNS	Modification Of TiO2 With Iron Oxide And Carbon/SiO_2 Rice Husk As Photocatalysts For Methylene Blue Degradation
P17	Aprilia Garin Aryanda	UNS	Adsorption Performance Of Mesoporous γ-Al_2O_3/ Activated Carbon/Chitosan Beads For Organic Dye Removal From Aqueous Solution
P18	Aryo Setyo Erawan	UNS	Surface Modification Of Titanium Material Coated With Hydroxiapatite/TiO_2 Using Slurry Coating Method As Dental Implant Application Candidates
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P21	Sriatun	UNDIP	Potential of Sodalite NPs with Copper, Zinc, and Silver Metal Ions as An Antibacterial Materials
P22	Suhartana	UNDIP	Synthesis Of Fe_2O_3 Pillar Clay And Test Of The Adsorbtion Capability Of NaCl On Well Water In Tambaklorok Semarang
P23	Mohamad Rafi	IPB	Application of Chemometrics in Indonesian Medicinal Plant Research
P24	Santi Nur Handayani	UNSOED	Synthesis Of C-3,4-Methoxyphenyl Calix[4] Pyrogalol Dodeca Cinnamate From Synthesis Of C-3,4-Dimethoxyphenylcalix [4]Pyrogal0arene With Cinnamoyl Chloride

Poster

Code	Presenter	Affiliation	Title
P25	Nindita Clourisa Amaris Susanto	UNS	Physicochemical Properties and Antioxidant Effect of Nanoemulsion Containing *Eugenia polyantha* Leaf Extract
P26	Mikael Hovhaness Nugroho Putro	UNS	Fatty acid profile and proximate content of powdered and dry extracts of snakehead fish (*Channa striata*)
P27	Eva Vaulina Yulistia Delsy | Ponco Iswanto | Hartiwi Diastuti | Puji Lestari	Unsoed	Selection of Ab Initio Calculation Method for Sulfate Based Surfactan Development
P28	Abu Masykur	UNS	Modification Of Macroporous Chitosan Crosslinked With Badge (Bisphenol A Diglycidyl Ether) Using Nacl As A Porogen For Adsorbing Procion Red MX 8B Dye
P29	Faqih Abil Mahazein, Earlene Michelle Mulia, Gabriel Alya Nugraha	UNS	Fullerenes as Reactive Oxygen Species Scavenger: A Mini Review
P30	Teguh Endah Saraswati	UNS	Characterization of Structural Changes of Iron Oxide/Carbon Nanocomposite Treated in Chemical Vapor Deposition
P31	Desi Suci Handayani	UNS	Synthesis And Antibacterial Activity Assay Of Polieugenol-Cellulose Acetate Composites With Additional Ag Ions
P32	Choiril Azmiyawati	UNDIP	Synthesis Of Silica/Chitosan@Glutaraldehyde As Slow Release Fertilizer On Pakcoy Mustard (*Brassica rapa* L.)

Materials Chemistry_21

Optimization of Silver Doping on Natural Dye Mixed Chlorophyll-Anthocyanin on the Efficiency of Dye Sensitized Solar Cells (DSSC)

Desita Suci Pangesti | Fahru Nurosyid | Risa Suryana | Yofentina Iriani

Physics Department, Faculty of Mathematics and Natural Sciences, Sebelas Maret University |
Physics Department, Faculty of Mathematics and Natural Sciences, Sebelas Maret University |
Physics Department, Faculty of Mathematics and Natural Sciences, Sebelas Maret University |
Physics Department, Faculty of Mathematics and Natural Sciences, Sebelas Maret University

Abstract

  This research examines silver doping with a mixture of anthocyanin and chlorophyll as a dye in Dye Sensitized Solar Cells (DSSC) to increase efficiency. Anthocyanin is extracted from butterfly pea flowers and chlorophyll from spinach leaves using the maceration method with a composition ratio of the anthocyanin solution and chlorophyll dye mixture, namely 1:3. Variations in silver doping used in the dye mixture are 0%, 3% and 5%. Characterization of the dye solution includes absorbance using a UV-Vis spectrophotometer and conductivity using a Keithley I-V meter. DSSC efficiency characterization was carried out using a Keithley I-V meter. The results of the absorbance characterization of silver doping in the mixed dye increase the absorbance peak and widen the absorption area. The conductivity characterization results show that silver doping in the mixed dye increases the conductivity with values of 4.43×10^{-2} $(\Omega m)^{-1}$ respectively; 6.46×10^{-2} $(\Omega m)^{-1}$; and 8.21×10^{-2} $(\Omega m)^{-1}$ at variations of 0%, 3%, and 5%. The DSSC efficiency values obtained were 0.073%, 0.209%, and 0.111% for silver doping variations of 0%, 3%, and 5%. The addition of silver doping increases efficiency 2-6 times compared to natural dye without doping.

Keywords: Keywords: DSSC, dye mixture, silver doping, chlorophyll, anthocyanin

Presenter: Desita Suci Pangesti (desita12@student.uns.ac.id)

Green Chemistry_22

Evaluation of Durian Seeds (*Durio zibethinus*) as a Natural Coagulant for Peat Water Treatment

Rudy Syah Putra, Rossa Amanda Putri

Universitas Islam Indonesia

Abstract

Water is one of the fundamental natural elements that is essential for human survival. Peat water is characterised by a brown or red colour, low acidity, high organic matter content, and high turbidity. One of the most frequently employed wastewater treatment techniques is coagulation-flocculation, largely due to the simplicity of its operational procedure. In the coagulation process of peat water, natural coagulants are employed in lieu of chemical coagulants, with durian seeds (Durio zibethinus) serving as the primary natural coagulant. The duration of stirring and the pH level are among the variables that can influence the outcome of the coagulation process. In this study, coagulation-flocculation was conducted with varying rapid mixing times, specifically 5, 10, and 15 minutes. Subsequently, coagulation-flocculation was conducted at varying initial pH levels, specifically pH 5, pH PZC, and pH 8. The findings indicated that coagulation with durian seeds (Durio zibethinus) resulted in a 98.7% reduction in turbidity, a 60.32% reduction in TDS, and a 47.7% reduction in iron metal concentration levels. Furthermore, it has the capacity to elevate the acidic pH towards a neutral pH, and to enhance light intensity by 83.28%.

Keywords: Coagulation-flocculation, Durian seeds (Durio zibethinus), Peat water, Rapid mixing time

Presenter: Rossa Amanda Putri (rossaamandaputriid@gmail.com)

Synthesis, Structure Elucidation and Fire Retardancy of Hexasubstituted Cyclotriphospazane Derivatives with Hydrazine Bridge Linkages

Megawati Mohd Yunus | Melati Khairuddean | Zuhair Jamain

1.School of Chemical Sciences, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia 2.Organic Synthesis and Advanced Materials (OSAM) Research Group, Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia. | School of Chemical Sciences, Universiti Sains Malaysia, 11800 USM, Penang, Malaysia | Organic Synthesis and Advanced Materials (OSAM) Research Group, Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia.

Abstract

This study presents the results of two derivatives hexasubstituted cyclotriphospazane compounds with tetradecyl terminal chains, designated S1C14 and S2C14. These derivatives were synthesized and characterized successfully using Fourier transform infrared spectroscopy (FTIR), nuclear magnetic resonance (NMR), and CHN elemental analysis. The derivatives are connected to different hydrazine linkages with the same terminal end length. The thermogravimetric analysis (TGA) and limiting oxygen index (LOI) test were used to determine the fire retardant properties of these compounds. The study used a moldable epoxy resin matrix with an LOI value of 22.75%. The addition of one wt.% of the cyclotriphosphazene derivatives increased the LOI values of epoxy resin to 25.53 and 25.90%, respectively. Overall, the LOI values for both final compounds were favorable. The LOI value of compound S2C14 was greater than that of compound S1C14. The electron-withdrawing group of the amide bonds and the high thermal stability of the Schiff base molecules all contributed to this compound's enhanced fire-retardant properties. The residue char of the compounds was investigated using a scanning electron microscope (SEM). The findings show that the morphology of the char appeared more compact and smaller. The char layer acts as a defense barrier and is strengthened while burning by the dissolving hydrazine linkages. This phenomenon indicates that modifying the cyclotriphosphazene system with an organic side arm having a hydrazine bridge can induce the fire retardancy of the molecules.

Keywords: Fire retardancy, hydrazine bridge, cyclotriphosphazane

Presenter: Megawati Mohd yunus (megasabar@student.usm.my)

Computational Chemistry_42

Theoretical Comparison of Stability between Carbon Monoxide (CO) and Oxygen (O_2) in Hemoglobin Complex Using Molecular Dynamics Simulation and Binding Free Energy Calculation

Oscar Oleta Palit

Kanazawa University

Abstract

Carbon monoxide (CO) is a significant environmental pollutant, especially in high-traffic areas, due to its strong affinity for hemoglobin, which disrupts oxygen binding. Directly measuring this impact in real-time scenarios is challenging, so computer simulation research using molecular dynamics (MD) is a viable alternative with the calculation of binding free energy between a protein and a ligand. This study investigates the differences in binding affinity between CO and O2 to hemoglobin. Initial structures are obtained from the protein data bank with PDB IDs 2DN1 (O2) and 2DN3 (CO), with Toluene added in 2DN1. MD input files were prepared using ChimeraX 1.8 and CHARMM-GUI, followed by minimization and equilibration.Results showed that the Root Mean Square Deviation (RMSD) and Root Mean Square Fluctuation (RMSF) values for the 2DN1 (O2) complex were below 2Å, indicating higher stability compared to the 2DN3 (CO) complex, which had values above 3Å. The Radius of Gyration and Solvent Accessible Surface Area (SASA) were also lower for 2DN1, further supporting its stability. However, the MMPBSA (Molecular Mechanics Poisson-Boltzmann Surface Area) free energy calculation revealed that the binding free energy for 2DN3 (CO) was lower (8.85 kcal/mol) than for 2DN1 (O2) at 9.82 kcal/mol, suggesting higher affinity of CO to hemoglobin despite its lower stability. This discrepancy shows that hemoglobin-HEM complex stability is greatly affected by the dynamics of atomic interactions, including the presence of a protein stabilizer.Further research with longer simulation times and optimal parameter tuning is suggested to enhance the validity of these computational findings.

Keywords: Carbon Monoxide (CO), Oxygen (O2), Hemoglobin-HEM, Molecular Dynamics (MD), Binding Free Energy

Presenter: Oscar Oleta Palit (o2315011063@stu.kanazawa-u.ac.jp)

Effect of Reflux on Surface and Pore Characteristics of Rice Husk and Teak Sawdust Activated Carbon

Cucun Alep Riyanto | Yohanes Ariesto | Fidelis Tertius Aluh Christyawardana | Yehez Kiel Sandy Pradana | Nicho Vernanda Wina Puspita | Iga Permata Sari | Marturia Ester Tumbelaka | Fuady Hanief | Wawan Rustyawan

Universitas Kristen Satya Wacana | Universitas Kristen Satya Wacana | Universitas Kristen Satya Wacana | Universitas Kristen Satya Wacana | Universitas Kristen Satya Wacana | Universitas Kristen Satya Wacana | Universitas Kristen Satya Wacana | Research and Technology Innovation (RTI) Pertamina | Research and Technology Innovation (RTI) Pertamina

Abstract

Rice husk and teak sawdust waste has not been utilized optimally and can cause environmental problems if burned. On the other hand, rice husk and teak sawdust are lignocellulosic materials that have the potential to produce activated carbon. This study aims to determine the effect of the reflux process on the quality of activated carbon from rice husk (RHAC) and teak sawdust (TSAC). The method used is rice husk and teak sawdust carbonized at a temperature of 400 °C (t=60 minutes). The reflux process of rice husk and teak wood uses 2N NaOH solution at a temperature of 100 °C (t=120 minutes). The carbon is activated using 30% H3PO4 with a carbon: H3PO4 ratio (1:3, w/w) for 60 minutes and then continued heating using a furnace at a temperature of 600 °C (t=60 minutes).The results of the analysis using FTIR showed that RHAC and TSAC have functional groups -O-H, -C-H Str, C≡C, C=C/C=O, -C-H, and P=O/C-O, especially Si-O in RHAC. The results of the SEM-EDX analysis on the surface of RHAC and TSAC contain elements of C, O, P, and Na. In RHAC specifically, there was an increase in the percentage of Si elements after the reflux process to 7.7%wt (originally 3.4%wt). The results of the SAA analysis showed that TSAC with reflux process had the largest surface area (SBET = 49.6795 m2/g), RHAC with reflux process had the largest total pore volume (VT = 6.710 x 10-2 cm3/g) also the largest pore diameter (DP = 48.1835 nm).

Keywords: activated carbon, pore, reflux, rice husk, teak sawdust

Presenter: Cucun Alep Riyanto (cucun.riyanto@uksw.edu)

Materials Chemistry_62

Modification Of Polivinil Alkohol Biocomposites With Water Hyacinth (*Eichhornia crassipes*) Fiber As Packaging Application

Sarawinda Hutagalung

Universitas Kristen Satya Wacana

Abstract

Biocomposites are material composed of natural and synthetic polymers that are biocompatible and eco-friendly composites. This research aims to determine the optimum PVA ratio and biocomposite characteristics by testing water adsorpsion, tensile strength, biodegradation rate and FTIR analysis. The biocomposites were prepared by using extrusion method and baking process. The optimum composition was obtained at a PVA ratio of 8%. The characteristics of biocomposites obtained by water absorption test was 7,81 %, tensile strength was 2,03 N/mm2 and biocomposites can be degraded 100% on day 12th day and the results of FTIR analysis showed the presence of O-H, C-H, C-O, and C=O functional groups.

Keywords: biocomposites, fiber, water hyacinth, PVA

Presenter: Sarawinda Hutagalung (sarawinda.hutagalung@uksw.edu)

Comprehensive Investigation (SEM-EDX, TEM and XRD) of Silica for SiO2+EG/W Nanofluids

Amri Abdulah | Budi Kristiawan | Sukarman | Khoirudin | Wibawa Endra Juwana | Agung Tri Wijayanta

Universitas Sebelas Maret,Surakarta | Universitas Sebelas Maret,Surakarta | Universitas Sebelas Maret,Surakarta | Universitas Sebelas Maret,Surakarta | Universitas Sebelas Maret,Surakarta | Universitas Sebelas Maret,Surakarta

Abstract

SiO2 nanoparticles have advantages in terms of water absorption and high thermal conductivity, so they can improve thermal performance. This innovative and sustainable solution is in line with the concept of energy efficiency. In this study, the chemical composition and size of nanoparticles were determined using SEM-EDX, TEM, and XRD. Based on the SEM results, the chemical composition is SiO2, then the particle size based on XRD and calculated using the Scherrer equation, produces a value of 1.15 nm, and based on TEM data it ranges from 18.2 nm to a maximum of 28.72 nm

Keywords: Particle size, Nanofluid, Silicon dioxide,SEM,TEM and XRD.

Presenter: Amri Abdulah (amri.abdulah@student.uns.ac.id)

Nanomaterials_71

Synthesis and Characterization of Silver-Substituted Cobalt Ferrite Using Coprecipitation Method as Alternative Antioxidant Material

Anggita Larasati | Riyatun | Triana Kusumaningsih | Budi Purnama

Sebelas Maret University | Sebelas Maret University | Sebelas Maret University | Sebelas Maret University

Abstract

Cobalt ferrite substituted by silver (Ag0.04Co0.96Fe2O4) was successfully produced using coprecipitation. Varying annealing temperatures (Ta: 200^{0}C, 300^{0}C, 400^{0}C, 500^{0}C, 600^{0}C) were applied to the samples to determine changes in structure, functional groups, morphology, magnetic properties, and the potential of nanoparticles as anti-oxidant materials. The results of XRD analysis show that all samples have a face-centered cubic (fcc) with the Fd-3m spacegroup, no Ag diffraction peaks were obtained so that the Ag atoms have entered the fcc structure. The size of the crystallites at an annealing temperature of 200^{0}C is 28.26 nm, at a temperature of 300^{0}C it decreases to 24.79 nm, at temperatures of 400^{0}C, 500^{0}C, and 600^{0}C it is 26,11 nm, 29,07 nm, and 29,22 nm. FTIR results show that all samples have Co-O and Fe-bonds O which fits the CFO structure. The VSM results show that at an annealing temperature of 300^{0}C to 600^{0}C there is an increase in the values of the coercivity field, saturation magnetization, and remanent magnetization respectively (0,28 kOe – 0,57 kOe), (15,08 emu/gr – 38,12 emu/gr) and (5,22 emu/gr – 14,46 emu/gr). The DPPH-based antioxidant activity test results showed an IC50 value of 524.67 ppm, indicating that the antioxidant activity is weak category.

Keywords: Ag0.04Co0.96Fe2O4, coprecipitation, antioxidant.

Presenter: Anggita Larasati (anggitalarasati@student.uns.ac.id)

Materials Chemistry_72

Synthesis of Magnetized and Functionalized Silica (Fe_3O_4@SiO_2@meso-SiO_2@TMPDT) for Adsorption of Metal Ion Cd(II)

Sri Hastuti

Analytical and Environmental Chemistry, Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Sebelas Maret, Surakarta, Indonesia

Abstract

The reduction of metal ion pollution, particularly Cd(II) ions in water, is a significant concern of researchers. This study aims to develop a magnetized silica (Fe3O4@SiO2) adsorbent functionalized with N1-(3-Trimethoxysilylpropyl)diethylenetriamine (TMPDT) for the adsorption of Cd(II) ions. The research begins with the formation of Fe3O4@SiO2, followed by the preparation of Fe3O4@SiO2@meso-SiO2 through the addition of CTAB and Na2SiO3 with volume variations of 1, 3, and 5 mL. The resulting material was then modified using TMPDT with volume variations of 1; 1.5; and 2 ml to produce the adsorbent of Fe3O4@SiO2@meso-SiO2@TMPDT. The characterization of Fe3O4@SiO2@meso-SiO2@TMPDT was carried out using FTIR, SEM-EDX, and TGA. The FTIR results indicated the presence of Fe-O-Si, N-H, and C-H groups on Fe3O4@SiO2@meso-SiO2@TMPDT. Additionally, a mass decrease of 38.875% was observed between 446 and 558 °C, likely due to the release of organic groups from the adsorbent. SEM-EDX characterization revealed the surface morphology of the adsorbent and indicated variations in the elemental composition between Fe3O4@SiO2 and Fe3O4@SiO2@meso-SiO2@TMPDT. The optimum conditions for adsorption of Cd(II) ions using Fe3O4@SiO2@meso-SiO2@TMPDT were determined to be a pH of 4.9 and a contact time of 20 minutes. The adsorption kinetics followed a pseudo-second-order model, and the adsorption isotherm conformed to the Langmuir isotherm model. The maximum adsorption capacity (Qm) of the adsorbent Fe3O4@SiO2@meso-SiO2@TMPDT for Cd(II) ions was found to be 28.089 mg/g.

Keywords: Synthesis, Magnetized, Functionalized, TMPDT, Adsorption, Cd(II)

Presenter: Sri Hastuti (srihastuti71@staff.uns.ac.id)

The Effect of Co-Processed Excipient and Manitol on Physical Properties and Release Test of Flavonoid Total of Bajakah Root (*Spatholobus littoralis* Hassk.) Water Extract of Effervescent Granule

Dian Eka Ermawati | Nurcahyo Fajar Trihantono | Ulfa Afrinurfadhilah Darojati

Universitas Sebelas Maret, Surakarta, Indonesia | Universitas Sebelas Maret, Surakarta, Indonesia | Universitas Sebelas Maret, Surakarta, Indonesia

Abstract

Bajakah root is traditionally used in traditional medication. It has IC50 of 0.155 mg/mL and total flavonoids 32.49 ppm. Bajakah roots are consumed by boiling but low in taste, smell, and less stability. Effervescent granules were chosen to overcome, be easily absorbed, and safely digestible. The fillers affect the physical properties of the granules and the release of active substances. This research aims to determine the effect of combining co-processed excipient-mannitol on evaluating granules and total flavonoid release. Infundation of Bajakah roots at ratios of 1:20 and 1:10; the filtrates are freeze-dried. Detection of total flavonoid and tannin contents using the UV-VIS spectrophotometer method. Co-processed excipients (lactose-manihot starch) in a ratio of 64.32%: 35.68% were made with wet granulation and then characterized using SEM. The variation of co-processed excipients-mannitol of 3:1, 2:2, and 1:3. Granule evaluation includes organoleptic, flow rate, angle of repose, moisture content, disintegration time, pH, and release of total flavonoids. Statistical analysis was performed using one-way ANOVA. Based on the research results, bajakah root water extract has a total flavonoid and tannin content of 2.19% and 9.04%, respectively. Co-processed excipients-mannitol variation significantly affects flow rate, repose angle, moisture content, and disintegration time but does not significantly affect the pH. The total flavonoid release meets the requirements of 80% for 60 min. Formula with a ratio of 1:3 is selected formula with an evaluation of a granule flow rate of 13.70±1.12 g/sec; angle of repose 28.38±0.94°; moisture content 2.42±0.07%; disintegration time 4.14±0.13 min; and pH 6.56±0.06.

Keywords: bajakah root; effervescent granule; physico properties; total flavonoids; relese test

Presenter: Ulfa Afrinurfadhilah Darojati (dianekaerma@gmail.com)

The Effect of Maltose-Sucrose on Physicochemical Properties of Bajakah Root Ethanolic Extract (*Spatholobus littoralis* Hassk.) Hard Lozenges, Release Test of Flavonoid Total and Sensory Test

Dian Eka Ermawati | Chaterine Turu' Padang | Nindita Claurisa Amaris Susanto | M. Nur Dewi Kartikasari | Vivin Sulistyowati

Universitas Sebelas Maret, Surakarta, Indonesia | Universitas Sebelas Maret, Surakarta, Indonesia | Universitas Sebelas Maret, Surakarta, Indonesia | Universitas Sebelas Maret, Surakarta, Indonesia | Universitas Sebelas Maret, Surakarta, Indonesia

Abstract

Bajakah roots contain flavonoids, phenolics, and tannins as antioxidants. The IC50 of Bajakah root ethanolic extract is 0.08 mg/mL, and at 5% can reduce tumor volume. Consuming extracts as supplements is unpleasant because of the unpleasant color, smell, and taste, so a drug delivery system is needed. Hard lozenges chosen because it has a pleasant taste, controlled release of active substances, absorption in the oral mucosa, and avoid first-pass metabolism. This study evaluated the maltose-sucrose combination on physicochemical properties, drug release, and sensory acceptability. Bajakah roots were macerated in 50% ethanol for three days, and the filtrate was evaporated. Detection of total flavonoid and tannin contents using the UV-VIS spectrophotometer method. Hard lozenge formula with ratios of sucrose-maltose 2:1, 1:1, and F3 1:2, respectively. Hard lozenges were tested for weight uniformity, hardness, disintegration time, sensory test, stability, and dissolution. Statistical analysis using one-way ANOVA. Based on the research results, bajakah root ethanolic extract has a total flavonoid and tannin content of 2.18% and 9.03%, respectively. Adding sucrose increases hardness, sweetness, smell and has a better release time, but does not affect the disintegration time. Ratio maltose-sucrose of 1:1 meets the requirement of an excellent hard lozenge based on Indonesia Pharmacopoeia 6th Edition with 250±9.93 mg; 9.30±2.08 Kg; 10.48±4.26 min; release 80% of active substance for 60 min. In addition, this formula was stable on low-temperature storage, most favored by the panelists, with a percentage of 65% stating that they liked it and 35% stating that they liked it.

Keywords: bajakah root; hard lozenges; physicochemical properties; total flavonoids; relese test

Presenter: M. Nur Dewi Kartikasari (dewi1812uns@gmail.com)

Computational Chemistry_85

Optimization And Validation Of A Large-Scale Virtual Screening Method For The Discovery Of Aldose Reductase 2 Inhibitor Frame From Natural Product Database

Fariz Rizky Alfian | Farly Yumna Faiq Rahardiarta

Departement of Chemistry Airlangga University | Departement of Chemistry Airlangga University

Abstract

Diabetes mellitus (DM) complications are largely linked to the Aldose Reductase 2 (ALR2) enzyme activation in the polyol pathway. DM patients, suffer from this pathway activation because of sorbitol accumulation and NADPH deficit. Therefore, ALR2 inhibitors (ARI) as the therapeutic drugs for DM complications were needed. Known ARI like epalrestat has been retracted due to failure in clinical trials caused by poor pharmacokinetics. Thus, further studies need to be done. Using a natural compound (NP) database, Structure-Based Virtual Screening (SBVS) can be done to identify possible ALR2 inhibitor candidates while optimizing and validating each step needed. NP database was acquired from COCONUT (895,557 compounds). This study strategically started from physicochemical properties screening to molecular docking, pharmacophore check, clustering, and molecular dynamics (MD) simulation with Linear Interaction Energy (LIE) and Molecular Mechanics with Generalized Born Surface Area (MM-GBSA). Parameters such as ADME properties, ability to identify active compounds (Reciever Operating Characteristic, ROC), ability to rank active compounds (Enrichment Factor, EF), and Protein-Ligand Interaction Fingerprint (PLIF) were also evaluated for optimization and validation purposes. Ultimately, seven candidates with ΔGexp under -9.7695 kJ/mol were acquired using LIE as the chosen method (R^2= 0.6294).

Keywords: Diabetes mellitus, ALR2 inhibitor, COCONUT, structure based virtual screening, molecular docking, MD simulation.

Presenter: Fariz Rizky Alfian (fariz.rizky.alfian-2020@fst.unair.ac.id)

The reinforcement effect of different concentration of silica from coal burning fly ash on styrene butadiene rubber

Indra Surya

Universitas Sumatera Utara

Abstract

This study explores the reinforcement effect of varying concentrations of silica derived from coal-burning fly ash on styrene-butadiene rubber (SBR) composites. As an abundant industrial by-product, coal fly ash presents a sustainable alternative to conventional fillers in rubber compounding. The research focuses on how different silica loadings, extracted from fly ash, influence the mechanical of SBR. Silica was extracted from fly ash obtained from different coal sources and incorporated into SBR at varying concentrations. The study systematically evaluates the impact of silica content on the tensile strength, modulus, elongation at break, and abrasion resistance of the SBR composites. Additionally, thermal stability was assessed to determine the efficacy of silica as a reinforcing agent. The findings reveal that increasing silica concentration enhances the stiffness and thermal stability of SBR but may reduce its flexibility. Optimal reinforcement was observed at 30 phr of silica loading, balancing mechanical strength with desirable elastic properties. This study underscores the potential of silica from coal fly ash as an effective, cost-efficient filler in SBR, contributing to more sustainable rubber manufacturing practices while maintaining material performance.

Keywords: reinforcement effect, silica, styrene butadiene rubber, mechanical properties

Presenter: Indra Surya (isurya@usu.ac.id)

Materials Chemistry_99

Effect of Particle Size of Various Inorganic Milled Particles on Protein Adsorption Behavior

Ahmad Bikharudin | Masahiro Okada | Takuya Matsumoto

Department of Biomaterials, Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, Japan | Department of Biomaterials, Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, Japan | Department of Biomaterials, Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University, Japan

Abstract

The particle size of inorganic particles as adsorbents and drug carriers impact protein adsorption behavior. This study evaluates the protein adsorption behavior of several inorganic milled particles, including bamboo charcoal, activated bamboo charcoal, silica, and hydroxyapatite. The various inorganic particles were milled for different periods to reduce particle sizes and enhance protein adsorption. The bicinchoninic acid assay kit determined bovine serum albumin's adsorption and desorption behavior on inorganic particles. The increased amount of bovine serum albumin adsorbed on inorganic particles correlated with the smaller particle sizes of inorganic particles. Due to the electrostatic interaction between -COO- groups and Ca2+ ions on the surface of hydroxyapatite, which is essential for the adsorption of acidic bovine serum albumin molecules, hydroxyapatite showed a higher ability to bind bovine serum albumin. Furthermore, the protein released from inorganics-proteins steadily increased when immersed in a phosphate buffer solution (pH 7.0). The amount of protein released from hydroxyapatite-protein was much lower than that from other inorganics-protein due to the strong immobilization of hydroxyapatite-protein. According to the findings, the particle size and physicochemical properties of adsorbents significantly impacted the adsorption behavior of acidic protein adsorbates.

Keywords: Particle size; Inorganic particles; Adsorbent; Bovine serum albumin; Electrostatic interaction.

Presenter: Ahmad Bikharudin (pkcf3z4e@s.okayama-u.ac.jp)

Materials Chemistry_106

An Eugenol Derivative Containing N-H Donating Groups for Anion Receptor

Venty Suryanti

Department of Chemistry, Faculty of Mathematics and Natural Sciences

Abstract

Eugenol is the main component of clove essential oil. It has been shown to have significant biological potential and a well-known antibacterial and antioxidant activity. Eugenol (4-allyl-2-methoxyphenol) is a monoterpenoid molecule that includes a phenolic hydroxyl and a carbon-carbon double bond. The structure of eugenol consists of functional groups of allyl, hydroxyl, and methoxy. Molecular modification of eugenol structure is one of the main strategies for its wider application, such as anion receptor. An amide eugenol derivative, N-3-amino-propyl-2-(4-alil-2-methoxy-phenoxy) acetamide (compound 1), has been successfully synthesized in three three-step reaction. This compound contains N-H groups that can donate protons to form hydrogen bonding. This compound has the potential to be applied as an anions receptor. This study was conducted to determine the interaction ability of compound 1 with F^-, CN^-, AcO^-, SO-42$^-$, and H2PO4$^-$. The anion binding ability of compound 1 was determined using 1H NMR spectroscopy. The anions gave different effects in 1H NMR spectra. The N-H proton peak of compound 1 disappeared upon adding 8 eq. CN^-, which indicated compound 1 was deprotonated. Adding H2PO4$^-$ resulted in N-H proton peak shifting, indicating a hydrogen bond formation between compound 1 and the anion. No changes in the 1H NMR spectra of compound 1 were observed upon adding F^-, AcO^-, and SO-42$^-$, which indicated no interaction between compound 1 and those anions. The result suggested that compound 1 can be used as a CN^- and H2PO4$^-$ anion receptor.

Keywords: anion receptor, donating protons, eugenol, hydrogen bonding

Presenter: Venty Suryanti (venty@mipa.uns.ac.id)

Materials Chemistry_109

Modification Of TiO_2 With Iron Oxide And Carbon/SiO_2 Rice Husk As Photocatalysts For Methylene Blue Degradation

Nova Septi Widyaning Putri | Farah Ramadhani Muhammad Syams | Teguh Endah Saraswati

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia

Abstract

Photocatalysis is one of the techniques that can decompose pollutants in water. One promising photocatalyst is TiO2. Nanocomposites of TiO2 modified by magnetic iron oxide and Carbon/SiO2 from Rice Husk (TICS) can inhibit the process of electron and hole recombination. The composition of TiO2 in TICS nanocomposites influences the magnetic properties and the efficiency of photocatalysis performance. Therefore, this research aims to study the effect of variations in TiO2 mass in TICS nanocomposites as a photocatalyst. TICS nanocomposites were synthesized using a microwave-assisted coprecipitation method. The main advantage of this nanocomposite is its magnetic property, which facilitates separation after the photocatalysis process. Vibrating sample magnetometer (VSM) analysis of the prepared TICS nanocomposites shows superparamagnetic properties. The XRD diffractogram pattern reveals peaks at 2θ for TiO2 (62.515˚), α-Fe2O3 (35.645˚), γ-Fe2O3 (35.807˚), Fe3O4 (35.645˚), carbon (54.192˚), and SiO2 (22.439˚). FTIR spectra show absorption at 1635 cm-1 (C=O vibration), 1104 cm-1 (asymmetric Si-O-Si vibration), 544 cm-1 (Fe-O vibration), and 477 cm-1 (Ti-O vibration). The morphological characteristics of TICS nanocomposites reveal a porous and rough surface with regularly shaped spherical particles in uniform size. Photocatalytic testing indicates that increasing the efficiency of the TICS nanocomposite photocatalyst can be achieved by adding TiO2 mass, accompanied by an initial dark agitation treatment before UV mercury lamp irradiation. The degradation efficiencies of TICS nanocomposites with TiO2 masses of 280 mg, 500 mg, and 2000 mg are 71.8%, 74.9%, and 43.4%, respectively.

Keywords: Iron Oxide, Microwave Synthesis, Photocatalysis, Silica, Titanium Dioxide.

Presenter: Nova Septi Widyaning Putri. (novasepti@student.uns.ac.id)

Materials Chemistry_110

Adsorption Performance Of Mesoporous γ-Al2O3/Activated Carbon/Chitosan Beads For Organic Dye Removal From Aqueous Solution

Aprilia Garin Aryanda | Ika Maria Ulfah | Diah Ayu Fitriani | Yayat Iman Supriyatna | Siti Amalina Azahra | Prabowo Puranto | Muhammad Prisla Kamil | Muhammad Kozin | Achmad Sofian Nasori | Teguh Endah Saraswati

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia | Research Center for Mining Technology, National Research and Innovation Agency (BRIN), South Lampung, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Research Center for Mining Technology, National Research and Innovation Agency (BRIN), South Lampung, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Research Center for Agroindustry, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia

Abstract

Methylene blue (MB) dye is one of the organic dyes that is widely used in the textile industry and disposed of without treatment. Adsorption is one method that is widely used to treat dye wastewater. In this study, the optimization of γ-Al2O3/activated carbon/chitosan (GAAC) beads via droplet extrusion for the adsorption of MB in an aqueous solution was carried out. γ-Al2O3 and activated carbon were synthesized performing coprecipitation and physical activation, respectively. The adsorption process used the batch method of aqueous solution with parameters including initial MB concentration, contact time, and pH. γ-Al2O3 was successfully synthesized by coprecipitation method with calcination temperature of 900 °C showed more homogeneous particle size distribution. The GAAC beads was designated as mesoporous structure with a mass variation of activated carbon (AC) of 0–0.03 grams. The most effective MB adsorption conditions were obtained using GAAC with the largest AC mass (GAAC-0.03) at pH 11 with an initial MB concentration of 5 ppm for 120 min with an adsorption efficiency of 92.06%. The adsorption isotherm that is closest to the MB adsorption process using GAAC is the Langmuir isotherm. The adsorption kinetics satisfied the pseudo-second-order (PSO) with a rate constant of 0.105 g/mg.min when using GAAC-0.03.

Keywords: γ-Al2O3, activated carbon, chitosan, kinetic and adsorption study, methylene blue

Presenter: Aprilia Garin Aryanda (apriliagarin@student.uns.ac.id)

Medicinal Chemistry_111

Surface Modification Of Titanium Material Coated With Hydroxiapatite/TiO_2 Using Slurry Coating Method As Dental Implant Application Candidates

Aryo Setyo Erawan | Diah Ayu Fitriani | Ika Maria Ulfah | Siti Amalina Azahra | Prabowo Puranto | Muhammad Kozin | Muhammad Prisla Kamil | Teguh Endah Saraswati

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Research Center for Mining Technology, National Research and Innovation Agency (BRIN), South Lampung, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Research Center for Advanced Materials, National Research and Innovation Agency (BRIN), South Tangerang, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia

Abstract

Dental implants are one of the best treatments for tooth loss. One of the dental implant materials is titanium, which is an inert material. However, material surface modification is generally needed to increase the biocompatibility of the implant material. This research aims to coat the surface of commercially pure titanium (Cp-Ti) with a mixture of TiO2 and hydroxyapatite (Hap) with varying mass ratios of TiO2:Hap = 10:0, 7:3, 5:5, 3:7, and 0:10. The coating was carried out using the slurry coating method without sintering accompanied by an immersion process in a simulated body fluid (SBF) solution to determine apatite formation. The results reveal irregular coating surface morphology due to the deposition of TiO2 and Hap, which have different particle sizes. In particular, all the coated Cp-Ti showed higher hydrophilicity than the uncoated Cp-Ti samples. The X-ray diffraction (XRD) spectra analysis confirmed that the percentage of deposited material was following the variations made. XRD analysis also confirmed that the increase in apatite indicated the growth of a new apatite layer after immersion in SBF of 27%, 14.03%, and 7.5% on the Cp-Ti substrate for the coatings of TiO2:Hap = 7:3, 5:5, 3:7 (m/m), respectively. In addition, the elemental Ca/P ratios analyzed by energy dispersive X-ray (EDX) spectroscopy increased to 1.59, 1.79, and 1.63 after the immersion process in SBF. This finding proves the phenomenon of apatite growth on Cp-Ti substrates resulting from simultaneous coating of both TiO2 and hydroxyapatite (Hap) after SBF immersion, indicating its potential uses as a dental implant candidate

Keywords: commercially pure-titanium (Cp-Ti), dental implants, hydroxyapatite, slurry coating, surface modification, TiO2

Presenter: Aryo Setyo Erawan (aryoerawan12@student.uns.ac.id)

Materials Chemistry_113

Synthesis Of Graphitic Carbon Nitride (Gcn)/TiO_2/NiO As Photocatalyst

Farhan Pandu Rifqu Abdilla | Teguh Endah Saraswati | Yuniawan Hidayat | Adi Darmawan | Christina Wahyu Kartikowati | Damar Nurwahyu Bima

Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia | Department of Chemistry, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Central Java, Indonesia | Department of Chemistry, Diponegoro University, Central Java, Indonesia | Department of Chemical Engineering, Brawijaya University, East Java, Indonesia | Department of Chemistry, Diponegoro University, Central Java, Indonesia

Abstract

The treatment of dye wastewater can be performed using the photocatalysis method. Combining carbon-based materials and metal oxides can overcome the recombination rate in photocatalytic activity. This study aims to synthesize graphitic carbon nitride (GCN), TiO2, and NiO as photocatalysts, previously studied using the density functional tight binding (DFTB) method. The GCN material and its modification were conducted by calcining the mixture of urea, titanium oxide, and nickel salts to produce GCN/TiO2, GCN/NiO, and GCN/TiO2/NiO composites. The DFTB method shows that GCN has the lowest energy, which aligns with the bandgap energy values experimentally estimated by UV-DRS from the synthesized materials. The XRD diffractogram patterns of GCN/TiO2, GCN/NiO, and GCN/TiO2/NiO show a peak at 2θ ~27^0, which is the main characteristic peak of GCN. The FTIR spectra show the presence of C–N, C=N, Ti–O, and Ni–O functional groups. The morphological characteristics of the photocatalyst materials are irregular and agglomerated. The Raman spectra characteristics indicate good graphitization of GCN and the appearance of typical metal oxide peaks. The SAA analysis shows that modifying GCN with TiO2 and NiO increases the surface area, pore volume, and pore size. UV-DRS analysis shows that the modification of GCN results in a narrowed bandgap energy. The prepared materials were applied as photocatalysts in the photodegradation of MB dye, giving the degradation efficiency percentages of 87,4%, 89%, and 87,7% using GCN, GCN/TiO2, and GCN/TiO2/NiO-0,01M, respectively, in which previously 30-mins pre-treated in dark followed by 90-mins of photocatalysis under an LED lamp illumination.

Keywords: DFTB, GCN, NiO, Photocatalysis, TiO2

Presenter: Farhan Pandu Rifqu Abdilla (farhanpandu@student.uns.ac.id)

The Influence Of Reflux Time On The Characteristics Of Low Si/Al Ratio Zeolites And Their Role As Catalysts For Esterification Reactions

Sriatun | I. Permata Sari | C. Azmiyawati

Department of Chemistry FSM UNDIP | Department of Chemistry FSM UNDIP | Department of Chemistry FSM UNDIP

Abstract

Low Si/Al ratio zeolite as catalyst in esterification reaction has been performed. Low Si/Al ratio zeolite has been synthesized using Si/Al ratio = 1, through reflux for one, three, and five hours at 80℃, where the sodium silicate as Si source and sodium aluminate as Al source. Meanwhile, the performance of low Si/Al ratio zeolite catalyst was tested in the esterification reaction of acetic acid and butanol. Characterization of the synthesized NaA zeolite includes XRD, SEM-EDX, GSA, total acidity, and FTIR. While the esterification product was characterized by GCMS and physical observations. The results showed that the low Si/Al ratio zeolite as NaA zeolite with a crystalline phase was obtained when the reflux time was five hours at a temperature of 80℃. but has the smallest surface area (1.28 m2/g) and total acidity (0.59 mmol/g) when compared to reflux times of one (28.26 m2/g and 0.62 mmol/g) and three hours (46.49 m2/g and 1.22 mmol/g). The low Si/Al ratio zeolite is able to increase the esterification yield, because without a catalyst only 34.81% is obtained. The highest esterification product is 75.95% at 0.15 g catalyst concentrations with a reflux time of one hour. So, we can be concluded that the performance of the catalyst is not influenced by crystallinity, but is strongly influenced by the surface area of the material and the total acidity.

Keywords: low Si/Al ratio, NaA, characteristics, catalyst, esterification

Presenter: Sriatun (sriatun@live.undip.ac.id)

Materials Chemistry_118

Potential of Sodalite NPs with Copper, Zinc, and Silver Metal Ions as An Antibacterial Materials

Sriatun | K. Pertiwi | C. Azmiyawati

Department of Chemistry FSM UNDIP | Department of Chemistry FSM UNDIP | Department of Chemistry FSM UNDIP

Abstract

Sodalite is the simplest zeolite and a porous material that has a high ion exchange capacity and large surface area. On the other hand, metals such as silver, copper, zinc and mercury have good antibacterial activity. Due to these metals are toxic if used directly, some efforts are needed to reduce the toxicity. The research aims to obtain silver, copper and zinc metal modified sodalite separately and determine their antibacterial activity on Escherichia coli and Staphylococcus aureus bacteria. Sodalite was synthesized from ludox and sodium aluminate precursors. Furthermore, the sodalite was modified with silver, copper and zinc via ion exchange. The material was characterized by XRD and SEM-EDX, while the antibacterial test was carried out using the disk diffusion method. The results show that the synthetic product as a white solid is sodalite crystals with a nano size of 47.6 nm based on XRD and has a shape like flat flower petals that are interconnected so that they appear spherical. The results of the antibacterial activity test show that zeolite loaded with copper metal ions has the best antibacterial ability against Escherichia coli and Staphylococcus aureus bacteria based on measurements of the average diameter of the resulting clear zone of 16.26 mm.

Keywords: sodalite, antibacterial, Copper, silver and zinc Metal Ions, disk diffusion

Presenter: Sriatun (sriatun@live.undip.ac.id)

Green Chemistry_134

Synthesis Of Fe_2O_3 Pillar Clay And Test Of The Adsorbtion Capability Of NaCl On Well Water In Tambaklorok Semarang

S. Suhartana, Maria Immaculata, S. Sriyanti

Department of Chemistry FSM UNDIP

Abstract

The research was carried out with the aim of synthesizing Fe2O3 pillared clay and testing the decolorization ability of Crystal violet dye. Synthesis of Fe2O3 pillared clay is carried out by activating the clay first. then pillaring of the clay is carried out by adding a pillaring agent to the activated clay suspension and then calcining it. Natural (L-A), activated (L-B), and pillared Fe2O3 (L-C) clays were characterized using FTIR and XRD to determine functional groups and basal spacing values. The adsorption ability of L-A, L-B, and L-C was carried out using well water from Tambaklorok by measuring the NaCl concentration using the Argentometry method. The results obtained from this research were that Fe2O3 pillared clay was produced which was characterized by a decrease in the SiOH/SiOSi ratio and an increase in the basal spacing value. There was an increase in basal spacing from 19.2 Å to 20.33 Å after activation. After pillaring with a ratio of OH-/Fe3+ = 0.2, basal spacing increased to 28.8 Å. The NaCl adsorption ability test was carried out with samples from well water in Tambaklorok, North Semarang district. The NaCl adsorption ability of acid-activated clay is 92.54% and the ability of Fe2O3 pillared clay is 95.11% at a contact time of 40 minutes. So the two adsorbents are not significantly different.

Keywords: Key words: Clay, Fe2O3 pillared clay, adsorption, NaCl

Presenter: Suhartana (suhartana@live.undip.ac.id)

Chemistry of Natural Products_135

Application of Chemometrics in Indonesian Medicinal Plant Research

Mohamad Rafi

Tropical Biopharmaca Research, International Research Center of Food, Nutrition, and Health, IPB University, Kampus IPB Taman Kencana, Bogor 16128, Indonesia

Abstract

Jamu, or Indonesian traditional medicine, comprises many medicinal plants and has been used and studied for a long time. Quality control of medicinal plants is essential to ensure the consistency of quality, efficacy, and safety of herbal medicinal products. Nowadays, many research activities in medicinal plant research use chemometrics analysis to identify biomarkers, contaminants, metabolite profiles, and authentication methods. As we know, chemometrics analysis has gained more attention in developing an analytical method for identifying, discriminating, and authenticating medicinal plants, identifying bioactive compounds using a metabolomics approach with the help of chemometrics, etc. So, in this presentation, we will give some information regarding the use of chemometrics analysis in Indonesian medicinal plants.

Keywords: chemometrics; medicinal plants; quality control

Presenter: Mohamad Rafi (mra@apps.ipb.ac.id)

Materials Chemistry_142

Synthesis Of C-3,4-Methoxyphenyl Calix[4]Pyrogalol Dodeca Cinnamate From Synthesis Of C-3,4-Dimethoxyphenylcalix[4]Pyrogaloarene With Cinnamoyl Chloride

Santi Nur Handayani | Rahmawati 'Ainun Fitri | Suwandri | Irmanto

Chemistry Department Faculty Mathematic and Natural Sciences UNSOED | Chemistry Department Faculty Mathematic and Natural Sciences UNSOED | Chemistry Department Faculty Mathematic and Natural Sciences UNSOED | Chemistry Department Faculty Mathematic and Natural Sciences UNSOED

Abstract

The compound C-3,4-dimethoxyphenylcalix[4]pyrogalil dodecacinamate was synthesized by refluxing C-3,4-dimethoxyphenylcalyx[4] pyrogallolarene and cinamoil chloride assisted by a deep pyridine catalyst. The synthesized compounds were analyzed by thin layer chromatography (TLC), solubility test, melting point test, FTIR spectrophotometer, 1H-NMR spectrometer, and 13C-NMR spectrometer. The synthesis results obtained were in the form of a brown (powder) with a yield of 75.30%; synthesis time 4 hours; soluble in chloroform and DMSO solvent and insoluble in distilled water, n-hexane, ethyl acetate, methanol, acetone; and melting point 220-225oC. The results of identification with FTIR showed absorption in 1735 cm-1 from the carbonyl ester, and identification using 1H-NMR showed a chemical shift signal from the methyne bridge group and a chemical shift δH 6.17 – 6.23 ppm from alkena from cinnamic group which indicated that the synthesis of calix cinamic had been successful.   Keywords: synthesis, C-3,4-dimethoxyphenylcalyx[4]pyrogallolarene, cinamoyl chloride, C-3,4-dimethoxyphenylcalyx[4]pyrogallil dodecacinamate

Keywords: synthesis, C-3,4-dimethoxyphenylcalyx[4]pyrogallolarene, cinamoyl chloride, C-3,4-dimethoxyphenylcalyx[4]pyrogallil dodecacinamate

Presenter: Santi Nur Handayani (santi.handayani@unsoed.ac.id)

Physicochemical Properties and Antioxidant Effect of Nanoemulsion Containing Eugenia polyantha Leaf Extract

Nindita Clourisa Amaris Susanto | Haykal Firgy Saputra | Anif Nur Artanti

Universitas Sebelas Maret | Universitas Sebelas Maret | Universitas Sebelas Maret

Abstract

Syzygium polyanthum leaves contain flavonoid compounds that are efficacious as antioxidants. However, flavonoids given orally have poor bioavailability. The purpose of this study was to overcome the solubility of flavonoids by formulating them into nanoemulsions. This research method uses an experimental method. The amount of tween 80, PEG 400, and eel oil in the nanoemulsion was determined by the simplex lattice design method. Testing to determine antioxidant power used the DPPH method. Antioxidant ability was measured based on the decrease in absorbance of DPPH at a wavelength of 517 nm. From the results of the antioxidant activity test, the IC50 values â€‹â€‹of quercetin, bay leaf extract, empty nanoemulsion, nanoemulsion with 100 mg extract, and nanoemulsion with 400 mg extract were respectively 4.26 ppm, 33.34 ppm, 155.48 ppm, 107.78 ppm, and 98.05 ppm.

Keywords: Syzygium polyanthum, nanoemulsion, physicochemical properties, antioxidant

Presenter: Nindita Clourisa Amaris Susanto (nindita_clourisa@staff.uns.ac.id)

Fatty acid profile and proximate content of powdered and dry extracts of snakehead fish (*Channa striata*)

Heru Sasongko | Mikael Hovhaness Nugroho Putro | Arinda Handiyah Sawitri | Josua Arianto Hutasoit | Sutarno

Department of Pharmacy, Vocational School, Sebelas Maret University .Jl. Ir. Sutami 36A Surakarta, Central Java, Indonesia. | Department of Pharmacy, Vocational School, Sebelas Maret University .Jl. Ir. Sutami 36A Surakarta, Central Java, Indonesia. | Department of Pharmacy, Vocational School, Sebelas Maret University .Jl. Ir. Sutami 36A Surakarta, Central Java, Indonesia. | Department of Pharmacy, Vocational School, Sebelas Maret University .Jl. Ir. Sutami 36A Surakarta, Central Java, Indonesia. | Department of Biology, Faculty of Mathematics and Natural Science, Universitas Sebelas Maret, Jl. Ir Sutami No.36A Surakarta, Central Java Indonesia, 57126

Abstract

The high protein content of snakehead fish (Channa striata), a tropical river/freshwater fish, makes it suitable for use in various processed products like dry powder and dry extract. This study aims to compare the nutritional content profile between powder and dry extract of snakehead fish. Dry extract of snakehead fish is made using the wet rendering method, while snakehead fish powder is made by drying snakehead fish meat using an oven at a temperature of less than 60 C. The nutritional content was analysed using proximate parameters including water, ash, lipid, protein, and fatty acid profiles. The results of the analysis showed that the proximate profile of snakehead fish powder contained 64.95% protein, 5.91% fat, 9.67% water content, and 14.89% ash content. While the dry extract of snakehead fish contained 48.71% protein, 3.22% fat, 8.31% water content, and 6.89% ash content. Furthermore, the total amount of EPA and DHA detected in snakehead fish powder was 0.0789% and 0.2580% and in dry extract of snakehead fish was 0.0322% and 0.0714%. These results indicate that the nutritional content of snakehead fish powder surpasses that of the dry extract.

Keywords: Snakehead fish; fatty acid; dry powder; dry extract

Presenter: Mikael Hovhaness Nugroho Putro (hovhaness.mikael@student.uns.ac.id)

Selection of Ab Initio Calculation Method for Sulfate Based Surfactan Development

Eva Vaulina Yulistia Delsy

Unsoed

Abstract

The discovery and development of sulfate anionic surfactant molecules need to be studied because it has a very large impact, both in the field of science an economics. It has been studied about The Quantitative Structure Property Relationships (QSPR) of the Concentration Micelle Critic theoretical sulfate anionic surfactant. The research was to obtain the best equation model and to calculate the Concentration Micelle Critic theoretical sulfate anionic surfactant. The research was done by using molecullar modelling of 12 sulfate anionic surfactants in three dimensional compound and the calculation was performed by ab initio 6-31G** method. The geometrical results of sulfate anionic surfactant produce descriptor data. The C16SO4Na compound has the highest value in some descriptors such as log P value of 7.4; refraction index value of 86.72 Ã…3; molecular weight value of 344.5 amu; polarization value of 1124,6 Ã…3; the Van der Waals surface area value of 701.64 Ã…2 and the Van der Waals volume value of 1124.6 Ã…3. The highest dipole moment descriptor is owned by C10SO4Na compound of 11.218 debye. The highest net charge descriptor of polar C atoms is 0.20925 owned by C12C(C2)SO4Na compound, while the highest net charge of non-polar C atoms is C6C(C6)SO4Na compound of -0.33193. The results of statistical calculation was obtain by linear regression equations with the following statistical parameters: n = 12; r = 0.984; r2= 0.968; SE = 0.1788; Fcount/ Ftable= 8.389609 and PRESS = 0.293388944.

*Keywords: CMC, ab initio, 6-31G**, sulfate anionic surfactant, QSPR*

Presenter: Eva Vaulina Yulistia Delsy | Ponco Iswanto | Hartiwi Diastuti | Puji Lestari (eva.delsi@unsoed.ac.id | ponco.iswanto@unsoed.ac.id | hartiwi.diastuti@unsoed.ac.id | puji.lestari0611@unsoed.ac.id)

Modification Of Macroporous Chitosan Crosslinked With Badge (Bisphenol A Diglycidyl Ether) Using Nacl As A Porogen For Adsorbing Procion Red MX 8B Dye

Abu Masykur

Chemistry Department, Mathematics and Natural Science Faculty, Sebelas Maret University

Abstract

A study was conducted on the modification of macroporous chitosan crosslinked with bisphenol A diglycidyl ether (BADGE) using NaCl as a porogen(CTS-BADGE) as an adsorbent for Procion Red MX 8B (PRM) dyes. CTS-BADGE adsorbent was synthesized through four stages: mixing chitosan solution with NaCl, crosslinking with BADGE, drying, and dissolving the NaCl porogen using distilled water to create pore cavities. The adsorption process for PRM dye was performed using a batch adsorption system with variations in pH, contact time, and initial PRM solution concentration. Characterization of CTS-BADGE wasÂ conducted using FTIR and SEM. SEM results showed that CTS-BADGE had large pores. The study results showed the optimum adsorption condition for PR MX 8BÂ dye on CTS-x-BADGE was at pH 3, 25Â°C, and 20 min contact time for 50 mg ofÂ adsorbent. The adsorption followed pseudo-second-order kinetics with anÂ adsorption rate constant of 4288 x 10-2 mg-1.min-1. The adsorption isotherm study followed the Freundlich model with an adsorption capacity of 0.1928 x 10-3 mol/g. It was found that crosslinking chitosan with BADGE produced a more stable adsorbent and the addition of porogen increased the adsorption capacity for PRM dye.

Keywords: Adsorption, Chitosan, Crosslinked, Porogen, Dyes,

Presenter: Abu Masykur (abumasykur@staff.uns.ac.id)

MatChem_151

Fullerenes as Reactive Oxygen Species Scavenger: A Mini Review

Faqih Abil Mahazein, Earlene Michelle Mulia, Gabriel Alya Nugraha, Teguh Endah Saraswati

Department of Chemistry, Sebelas Maret University, Department of Chemistry, Sebelas Maret University, Department of Chemistry, Sebelas Maret University, Department of Chemistry, Sebelas Maret University

Abstract

Fullerene is a carbon allotrope characterized by its unique spherical cage-like molecular structure. The most well-known fullerene is buckminsterfullerene (C60), with each carbon atom bonded to three others in a hexagonal arrangement and one carbon atom bonded to five others in a pentagonal arrangement. This structure gives fullerenes their exceptional stability and unique properties. Fullerene has various applications because of its propensity for engaging in diverse chemical interactions and electronic characteristics. One notable application is reactive oxygen species (ROS) scavenger. ROS, byproducts of cellular metabolism, can induce oxidative stress and contribute to various pathological conditions. This article reviews fullerene's potential in mitigating ROS arises from its ability to efficiently neutralize these reactive molecules, thereby protecting biological systems from oxidative damage. Despite its advantages, such as high reactivity and stability, fullerene presents certain challenges, including potential toxicity at high concentrations and issues with biocompatibility. Addressing these limitations through targeted research could enhance fullerene's efficacy and safety, paving the way for its broader application in medical and environmental contexts as an effective ROS scavenger.

Keywords: Fullerene, ROS Scavenger, Fullerene Derivatives, C60, ROSs

Presenter: Faqih Abil Mahazein, Earlene Michelle Mulia, Gabriel Alya Nugraha
(abilmahazein@student.uns.ac.id, earlchelrin19@student.uns.ac.id, gabrielalya@student.uns.ac.id)

Green_153

Characterization of Structural Changes of Iron Oxide/Carbon Nanocomposite Treated in Chemical Vapor Deposition

Teguh Endah Saraswati

Sebelas Maret University

Abstract

Chemical vapor deposition (CVD), especially thermal and plasma-enhanced CVD (PE-CVD), has been widely used for carbon nanomaterial synthesis. In the present study, we investigated the structural changes of carbon-based nanocomposite treated in CVD. The nanocomposite is iron oxide/carbon prepared using submerged arc discharge in the liquid medium of ethanol 50% (v/v). The prepared nanocomposite was then used as a catalyst in both thermal- and plasma-enhanced CVD in various pressure conditions and gas environments, in which acetylene and argon gas were used as primary carbon source and carrier gas, respectively. The existing broader X-ray diffraction peak of carbon C(002) assigned the structural changes, indicating that the graphite layers supposedly transformed into carbon atoms in sp2 and quasi-sp2 hybridization structures after CVD treatment. For a more detailed study, we performed the other assignment by transmission electron microscopy, which successfully observed the presence of graphitic layer structure recovery in material processed in plasma-enhanced CVD without removing the magnetic properties. The EDX results strengthened transmission electron microscopy (TEM) analysis, which successfully observed the presence of graphitic layer structure recovery in material processed in plasma-enhanced CVD without destroying the magnetic iron compounds. According to the results observed, the CVD process applied in this study could potentially be used as a material structural modification technique, especially for carbon-based magnetic nanomaterials.

Keywords: submerged-arc discharge, carbon, chemical vapor deposition, iron oxide, nanocompositess

Presenter: Teguh Endah Saraswati (teguh.kimia@staff.uns.ac.id)

Poly_157

Synthesis And Antibacterial Activity Assay Of Polieugenol-Cellulose Acetate Composites With Additional Ag Ions

Desi Suci Handayani *, **Muhammad Iqbal Nur Hasan, and Witri Wahyu Lestari**

Universitas Sebelas Maret

Abstract

Synthesis of polyeugenol-cellulose acetate composite with addition of Ag ions was conducted. Synthesis of polyeugenol was carried out by cationic addition polymerization of eugenol under nitrogen atmosphere in the presence of $BF_3O(C_2H_5)2$ as catalyst. Cellulose acetate was synthesized by acetylation of cellulose using acetic anhydrate as acetylating agent and sulfuric acid as catalyst in acetic acid glacial. The synthesis of polyeugenol-cellulose acetate composite was conducted at room temperature in a solvent composed of dichloromethane:acetone (1:1) with variations in the addition of ion Ag 0,025 g; 0,05; and 0,1 g. Synthesized materials were identified using Fourier Transform Infrared Spectrocsopy, UV-Visible Spectroscopy, Scanning Electron Microscopy–Energy Dispersive X-Ray Spectroscopy, and antibacterial activity assay against Eschericia coli ATCC 25922 dan Staphylococcus aureus ATCC 25923 bacteria. FTIR of polyeugenol showed OH, aromatic Csp2 -H, methyl CH, aromatic C=C, and -OCH3 peaks, also missing vinyl and allyl peaks while cellulose acetate with reduced OH peak and formed ester C=O, and C-O ester peaks. Composite successfully synthesized proven by FTIR showing both polyeugenol and cellulose acetate peaks with shifted OH due to hydrogen bonding and C=O and C-O ester peaks due to addition of ion Ag. UV-Vis showed composite has wavelength maximum of polyeugenol and cellulose acetate with shifted wavelength maximum and changed absorbance due to addition of Ag ions. SEM-EDS of composite showed fiber sheet cellulose acetate with polydispersed polyeugenol and addition of Ag ions gives rough surfaces and polydispersed. Composite with and without addition of Ag ions showed no antibacterial activity.

Keywords: antibacterial, polyeugenol-cellulose acetate composite, polyeugenol, cellulose,s

Presenter: Desi Suci Handayani (desisuci@staff.uns.ac.id)

MatChem_173

Synthesis Of Silica/Chitosan@Glutaraldehyde As Slow Release Fertilizer On Pakcoy Mustard (*Brassica rapa* L.)

Choiril Azmiyawati, Novianty Salsabila, Retno Ariadi Lusiana, Adi Darmawan

Department of chemistry, Faculty of Science and Mathematics, Diponegoro University, Department of chemistry, Faculty of Science and Mathematics, Diponegoro University, Department of chemistry, Faculty of Science and Mathematics, Diponegoro University, Department of chemistry, Faculty of Science and Mathematics, Diponegoro University

Abstract

The presence of nitrogen (N), phosphorus (P) and potassium (K) nutrients in the soil is very important because it affects soil fertility. One way to increase the efficiency of uptake and use of artificial nitrogen fertilizers (especially urea) is by reducing the solubility of nitrogen fertilizers using a matrix known as Slow release fertilizer (SRF). SRF is a type of fertilizer used to provide nutrients gradually and in accordance with plant needs. So this research aims to obtain silica gel and silica-chitosan embedded fertilizer and coated with glutaraldehyde as slow release fertilizer, determine the characteristics of slow release fertilizer, and determine the effect of the addition of slow release fertilizer on the growth of pakcoy mustard (Brassica rapa L.). In this study, the manufacture of SRF was carried out through four stages, namely the manufacture of silica gel, the manufacture of silica-chitosan, the loading of fertilizer and glutaraldehyde, and the application on pakcoy. The resulting product was analyzed using Fourier Transform Infrared (FTIR), Scanning Electron Microscopy-Energy Dispersive X-Ray (SEM-EDX), and Gas Sorption Analyzer (GSA) to determine its characteristics, such as functional groups, morphology, composition and to determine surface area, pore volume, and pore size distribution. Slow-release fertilizer testing was carried out by spreading 0.3 grams of fertilizer in 900 grams of media on pakcoy mustard greens and observations were made for 20 days. The slow release fertilizer products obtained were yellow in color, namely SGCG and SKCG with a weight of 2.468 grams and 2.502 grams respectively. FTIR results showed the most important difference between SG and SK with the appearance of spectra at wavelengths around 3000-3700 cm-1 which indicates the presence of chitosan groups on silica gel. The presence of urea and glutaraldehyde is characterized by the presence of absorption around 1400 cm-1 and 1300 cm-1 in both SGCG and SKCG which indicates the presence of NH groups from urea and CH groups from glutaraldehyde. SEM-EDX analysis results showed the interaction of silica with chitosan as seen from its morphology and nitrogen content of 8.05% and 11.75%. From the GSA measurement results, the samples are included in the mesopores known from the pore sizes of silica gel, silica-chitosan, SGCG, and SKCG which are 5.73; 5.32; 5.60; and 6.16 nm. The results of duplo analysis for pakcoy mustard growth with SGCG fertilizer are relatively better than SKCG.

Keywords: SRF, Mespore, silica, chitosan, pakcoy mustards

Presenter: Choiril Azmiyawati (choiril.azmiyawati@live.undip.ac.id)