

SKAM31

UNITING SCIENCE TOWARDS
FRONTIER INNOVATIONS

INTERNATIONAL CONFERENCE OF ANALYTICAL SCIENCES

'Uniting Science Towards Frontier Innovations'

17th - 19th
August 2018

Vistana Hotel,
Kuantan, Pahang

Organised By:



الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



IIUM Kuantan
DEPARTMENT OF
CHEMISTRY



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FOREWORD



السلام عليكم ورحمة الله وبركاته

I am honored to welcome all participants to the 31st International Conference of Analytical Sciences 2018 (SKAM31) that is jointly organised by the International Islamic University Malaysia (IIUM) and Malaysian Analytical Science Society (ANALIS). We are honoured to collaborate with the Malaysian Analytical Science Society.

The theme for the 31st International Conference of Analytical Sciences 2018 (SKAM31) is “*Uniting Sciences Towards Frontier Innovations*”. This conference brings together scientists from all over the world to discuss various related issues and provide the opportunity to discuss and share experiences, as well as to think together about the future we envisage for our future generations. I am convinced that the ensuing deliberations and discussions will contribute towards a more systematic research of contemporary analytical chemistry in Malaysia.

The SKAM31 is organised as an effort to advance knowledge as emphasised in the Qur’an for men to make efforts to change some of the current realities of our surrounding world. The Qur’an urges Muslims to seek *‘ilm* (knowledge), by engaging in research in pursuit of finding solutions to the plethora of problems faced by humankind in this millennium. The methodologies adopted to identify the solutions will go a long way to reveal Allah’s (SWT) benevolence as the Creator and His Wisdom.

On behalf of the International Islamic University Malaysia, I extend our warm welcome to all participants of the SKAM31. I sincerely wish this conference success in breaking new grounds in the field of chemistry. I am sure the presentations and discussions will enrich and further strengthen the commitment to improve the quality of life of humankind. I also thank the organising committee for all their efforts in conceptualising and successfully organising SKAM31.

Thank you. والسلام

**DZULKIFLI ABDUL RAZAK, PROF. TAN SRI DATO’
RECTOR,
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA**

WELCOMING MESSAGES



Assalamualaikum Warahmatullahi Wabarakatuh

It is an honour and privilege for Kulliyah of Science, International Islamic University Malaysia (IIUM) to have been given the opportunity to host the 31st International Conference of Analytical Sciences (SKAM31). On behalf of the Kulliyah, I heartily welcome all honourable speakers and participants to this 31st annual conference at Kuantan, Pahang with an inspiring theme, “*Uniting Science Towards Frontier Innovations*”.

Kulliyah of Science strongly encourages its staffs and community to always engage in innovative activities and foster continuous improvement. We believe that this event, which gathers local as well as international scientists and researchers will be a good platform to showcase their research and discuss the issues pertaining to analytical chemistry and its related fields. We also believe that this event will be scientifically invigorating, while new collaborations and friendships can emerge and also to encourage participants especially the young researchers to explore current research ideas in the field of analytical chemistry.

I would like to express my sincere appreciation to the invited speakers, all participants and particularly the organising committee of SKAM31 in making this conference a success. Finally, I wish you fruitful discussion in this conference and hope you could spend some time to enjoy the beauty of Kuantan city.

Thank you.

ASSOC. PROF. DR. SHAFIDA ABD HAMID
ADVISOR OF SKAM31



Assalamualaikum and Salam Sejahtera

On behalf of the organising committee, it is my pleasure to welcome all participants to Kuantan and our warmest welcome to all four invited speakers. We are very honored to host 31st International Conference of Analytical Sciences 2018 (SKAM31). This event is co-organised by the Department of Chemistry, Kulliyah of Science, IIUM with Malaysian Analytical Sciences Society (ANALIS).

Our conference's theme "*Uniting Science Towards Frontier Innovations*" incorporates new findings across interdisciplinary research in science to provide the latest information and knowledge for future advancement in science research. Furthermore, this conference will provide a good platform for researchers and scientists to present and share knowledge, disseminate ideas and to create a platform for collaborative research in the related fields.

I would like to congratulate all participants for being a part in this conference. I am sure that you will find this conference are both fulfilling in embracing new knowledge and enjoyable with huge opportunities for future research collaboration. Thank you very much to all who have contributed either directly or indirectly to the success of this conference, as well as to all sponsors for the generous contributions. Last but not least, to the organising committee for their perseverance, hardwork and endless support to ensure that this event is successful. May Allah's blessing be upon you.

Thank you.

ASSOC. PROF. DR. NURZIANA NGAH
CHAIRMAN OF SKAM31



Greetings from Malaysian Analytical Sciences Society!

On behalf of the Malaysian Analytical Sciences Society (ANALIS), I am delighted to welcome all participants to the International Conference of Analytical Sciences (SKAM31), an annual event under the auspices of the ANALIS. ANALIS would like to welcome the International Islamic University Malaysia (IIUM) into the fraternity of SKAM co-organisers; the ANALIS board members greatly appreciate IIUM's effort through the Department of Chemistry, Kulliyah of Science, IIUM Kuantan for hosting the 31st annual seminar (SKAM31) in Kuantan, Pahang, Malaysia from 17th – 19th August 2018.

Since its inauguration in 1987, ANALIS is recognised as a leading scientific society to foster the interest and provide platform in bringing rapid development in the field of analytical sciences in Malaysia through SKAM conference series. For this year, the theme chosen for SKAM31, “*Uniting Science Towards Frontier Innovations*” highlighted the importance of uniting and bridging all analytical sciences related field towards the development of innovations and creative ideas. Thus, SKAM31 paves the way to gather all academicians, researchers and students from diverse analytical sciences related field to meet, learn and showcase their research findings, application and advancement of instrumentations, conduct productive discussion as well as to foster essential professional and social networks.

I would like to congratulate the committee members from the Department of Chemistry, Kulliyah of Science, IIUM Kuantan for their time and great efforts in organising SKAM31. My sincere appreciation and heartfelt thank to all of our sponsors for their generous contribution and support for this conference. I would also like to thank our invited speakers and all the presenters for sharing their knowledge and research discoveries in this platform. Lastly, I wish all the participants a fruitful time of deliberation and discussion. Have an enjoyable and memorable stay in Kuantan.

Thank you.

PROF. DR. NORHAYATI MOHD TAHIR
PRESIDENT OF ANALIS

CONFERENCE BACKGROUND

The 31st International Conference of Analytical Sciences 2018 (SKAM31) is jointly organized by International Islamic University Malaysia (IIUM) and Malaysian Analytical Sciences Society (ANALIS). SKAM31 will be held on 17th - 19th August 2018 in Kuantan, Pahang. SKAM 31 will bring together researchers, scientists, academicians and students to share their findings in related areas of research in analytical science and chemistry. Since its inauguration in 1987, SKAM has provided tremendous findings and contributions for the scientific community in various analytical-related fields.

SCOPE OF CONFERENCE

The conference comprises of invited speaker, parallel and poster sessions. The topics to be covered are:

- Inorganic Chemistry
- Organic Chemistry
- Material Chemistry
- Environmental Chemistry
- Spectroscopies Technique
- Food Chemistry & Biotechnology
- Pharmaceutical and Nutraceutical Chemistry
- Cosmeceutical Chemistry
- Aqua Chemistry
- Nuclear Chemistry
- Catalysis
- Any related analytical sciences

PREVIOUS HOST OF “SIMPOSIUM KIMIA ANALISIS MALAYSIA – SKAK1 UNTIL SKAM31

Year	Institution	Year	Institution	Year	Institution	Year	Institution
1987	UKM	1996	USM	2004	UiTM	2012	UKM
1988	USM	1997	UKM	2005	UTM	2013	UNIMAS
1989	UTM	1998	UTM	2006	UPM	2014	UTM
1990	UPM	1999	UMT	2007	ANALIS and UKM	2015	UPM
1991	UM	2000	UPM	2008	UMS	2016	USM
1992	UiTM	2001	Agensi Nuklear Malaysia	2009	Co-Host with ASIANALYSIS X	2017	ANALIS
1994	ANALIS and UKM	2002	USM	2010	UMT	2018	IIUM
1995	UPM	2003	UNIMAS	2011	UiTM		

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TENTATIVE PROGRAMME

TIME	DAY 1 (17th August 2018)
16:00 – 18:30	Early Registration
TIME	DAY 2 (18th August 2018)
8:00 – 9:00	Registration and arrival of participants and guests
9:00 – 9:30	Welcoming remarks by SKAM31 Chairperson Opening remarks by ANALIS President
VENUE-BALLROOM	
9:30 – 10:15	INVITED SPEAKER
	<i>Advances in the Determination of Biogenic Amines</i> Prof. Dr. Bahrudin Saad (Universiti Teknologi Petronas)
VENUE-BALLROOM	
10:15 – 10:45	Tea break
10:45 – 12:30	Parallel Session 1 (Rooms A, B, C, D, E) Poster Session Exhibition
12:30 – 14:15	Lunch break / poster session / exhibition
14:15 – 15:00	INVITED SPEAKER
	<i>Rare Earth Elements (Lanthanides) Assessment in Rocky Shore Organisms and Surface Sediment Along Peninsular Malaysia Coastal Waters</i> Prof. Dr. Kamaruzzaman Yunus (International Islamic University Malaysia)
VENUE-BALLROOM	
15:00 – 15:30	SESSION WITH ANTON PAAR
	<i>Microwave-assisted Solutions in the Laboratory – Possibilities and Restrictions</i> Dr. David Reishofer
VENUE-BALLROOM	
15:30 – 16:30	Poster Evaluation Exhibition
16:30 – 17:00	Tea break / poster session / exhibition
17:00 – 18:00	ANALIS Annual General Meeting 2018
VENUE: ROOM B	
20:00 – 22:00	Opening ceremony Conference dinner ANALIS awards
VENUE-BALLROOM	

TIME	DAY 3 (19th August 2018)
9:00 – 9:45	INVITED SPEAKER
	<i>Facile Organic-inorganic Hybrid Sorbents for Extraction of Pollutants from Aqueous Samples</i> Prof. Dr. Mohd. Marsin bin Sanagi (Universiti Teknologi Malaysia)
	VENUE: BALLROOM
9:45 – 10:15	SESSION WITH LYNAS
	<i>Analytical Chemistry, Rare Earths and Lynas</i> Mr. Richard Amata
	VENUE: BALLROOM
10:15 – 10:45	Tea break / poster session / exhibition
10:45 – 12:30	Parallel session 2 (Rooms A, B, C, D, E) Poster session Exhibition
12.30 – 14:15	Lunch break / poster session / exhibition
14:15 – 15:00	INVITED SPEAKER
	<i>Processing of Minerals Containing Naturally Occurring Radioactive Minerals (NORM) in Malaysia: Issue and Prospect of Green Approach</i> Prof. Dr. Amran Ab. Majid (Universiti Kebangsaan Malaysia)
	VENUE: BALLROOM
15:05 – 16:05	Parallel session 3 (Rooms A, B, C, D, E) Exhibition
16:05 – 16:30	Tea break
16:30 – 17:30	Closing ceremony Best presenter awards
	VENUE: BALLROOM

INVITED SPEAKERS



PROF. DR. BAHRUDDIN SAAD

Fundamental & Applied Sciences Department, Universiti Teknologi Petronas, 32610, Seri Iskandar, Perak.

PROF. DR. KAMARUZZAMAN YUNUS

Department of Marine Science & Technology, Kulliyah of Science, International Islamic University Malaysia, 25200, Kuantan, Pahang.



PROF. DR. MOHD MARSIN SANAGI

Department of Chemistry, Faculty of Science, Universiti Teknologi Malaysia, 81310, UTM Johor Bahru, Johor.



PROF. DR. AMRAN AB MAJID

NORM Research Group, Advance Science Centre, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, Bangi, Selangor.



———— INVITED SPEAKERS - ABSTRACTS

INVITED SPEAKER 1

ADVANCES IN THE DETERMINATION OF BIOGENIC AMINES

Bahrudin Saad^{1*}

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Abstract

Biogenic amines (BAs) are low molecular mass nitrogenous compounds with aliphatic (e.g., spermine, spermidine, putrescine, cadaverine), heterocyclic (e.g., tryptamine, histamine) or aromatic (e.g., phenylethylamine, tyramine) structures. Small amounts of BAs are synthesised in plant and animal cells, while larger quantities are found as a consequence of microbial metabolism in a wide range of fermented foods such as fermented sausage and fish products, cheeses, fermented vegetables, and beverages. Meanwhile, their content in food samples varies to a great extent, and are strongly dependent on the composition, microbial flora and fermentation conditions. Therefore, the analysis of BAs is important as indicator of degree of food freshness or spoilage as well as to evaluate their toxicological risks. The analytical determination of BAs is challenging, mainly due to the fact that BAs are relatively polar compounds, making them extraordinary difficult to be extracted using the traditional organic solvents. Many of the BAs also lack the intrinsic structures for substantial absorption for the normal UV or fluorescence detection.

Over the years, our group had been developing analytical methods to meet the aforementioned challenges. The main advances are in the area of sample pretreatment as this is the bottleneck in the entire analytical step. Strategies to achieve this include the use of specialised sorbents coated with crown ethers and hydrazones. These sorbents offer unique selectivity for certain types of BAs. Another interesting approach was the *in-situ* derivatization and extraction based on hollow-fibres liquid phase microextraction. This technique deserves special mentioning as it provides a new paradigm shift in measurements as it not only uses minute amounts of extracting solvents (~ 5 μ L) but the extraction and derivatization are feasible in a single step! From the environment point of view, there is also much concern on the role of BAs as potential precursors for the formation of highly carcinogenic N-nitroso compounds. Towards this end, we have developed a capillary electrophoresis method using capacitively coupled contactless conductivity detection for the simultaneous determination of BAs in environmental water, including seawater. This method enables the simultaneous determination of BAs without the need for derivatization. Results on the analysis of BAs on selected Malaysian products such as fermented fish, sauce, etc will be shared.

Keywords: biogenic amines, sample pretreatment, food and environment analysis

INVITED SPEAKER 2

RARE EARTH ELEMENTS (LANTHANIDES) ASSESSMENT IN ROCKY SHORE ORGANISMS AND SURFACE SEDIMENT ALONG PENINSULAR MALAYSIA COASTAL WATERS

Kamaruzzaman Yunus^{1*}

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**Corresponding author: kama@iium.edu.my*

Abstract

This study explores the bioavailability of REEs in the ecosystem of rocky shore area along Peninsular Malaysia coastal waters, relating their partitioning between surface sediment and chosen bioindicator and deliberating on interspatial, interspecies, and inter-tissue variation. Teflon Bomb technique was used for digestion method, followed by ICP-MS measurement of 14 naturally occurring REEs concentration. The fractionation patterns of REEs normalized to chondrite or shale showing such data were comparable, hence, representing a mutual source of the REEs for the entire region. Yet, mean concentration finding proposed that east Peninsular Malaysia coasts delivers higher REEs compared to west peninsula area. Constant REEs abundance patterns all samples were shown, with enrichment of LREEs over HREEs. This suggests that REEs are transferred as a consistent group over aquatic ecosystems. There are dissimilarities in the REEs abundance for each site, but they demonstrate similarities in their REEs distribution patterns, which propose that they are of parallel origins. The contaminant metals As, Mn, Cu, and Cd were significantly correlated with REEs ($p < 0.05$ and $p < 0.01$), consequently suggests that these metals are probably non-anthropogenic in origin as the REEs are geogenic in origin. Anomalies calculation was executed by normalized values to data of chondrite, PAAS and NASC. Results showing ratios for Ce and Eu are higher than unity for former and vice versa for the latter in all places. Filter feeder *S. cucullata* showing potential as a good bioindicator for REEs as a result of its feeding behavior that correlated to particulates as REEs sources. Consistent chondrite-normalized pattern strongly proposes that the REEs accumulated by *S. cucullata*, *T. clavigera* and *N. chameleon* are derived mostly from indigenous rocks. Findings suggested that the values are significantly lower than the safety limit. With regards to sediment, comparative analysis resolved that the concentration of surface sediment in this study is very low compared to limit sets.

INVITED SPEAKER 3

**FACILE ORGANIC-INORGANIC HYBRID SORBENTS FOR
EXTRACTION OF POLLUTANTS FROM AQUEOUS SAMPLES**

Mohd Marsin Sanagi^{1,2*}, Nyuk-Ting Ng¹, Amirah Farhan Kamaruddin¹, Faridah M. Marsin¹,
Mohamad Raizul Zinalibdin¹, Zetty Azalea Sutirman¹, Aemi S. Abdul Keyon¹, Wan Aini Wan Ibrahim^{1,2}

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Abstract

Rapid and efficiency extraction or removal of pollutants from aqueous samples has been an important issue in analytical science. Solid phase extraction using sorbents is a well-known separation method and recognized as one of efficient and economic methods for removal of pollutants from water. In the past few years, there has been growing interest on extractions using organic-inorganic hybrid materials. Formed by incorporating inorganic species into organic matrix, these materials possess advantages such as high selectivity, permeability, and mechanical and chemical stabilities. This paper discusses recent significant advances in analytical solid-phase extraction employing organic-inorganic composite and nanocomposite sorbents for the extraction of organic and inorganic pollutants from aqueous samples. Classifications and synthesis methods of organic-inorganic hybrid sorbents are described. The physicochemical characteristics, extraction properties and analytical performances of sorbents are discussed, including morphology and surface characteristics, types of functional groups, interaction mechanism, selectivity and sensitivity, accuracy, and regeneration abilities. Organic-inorganic hybrid sorbents in combination with extraction techniques are highly promising as an emerging research field for sample preparation of samples such as food, biological and environmental matrixes with analytes at trace levels.

Keywords: organic-inorganic hybrid sorbents, extraction methods, environmental pollutants, aqueous samples

INVITED SPEAKER 4

**RADIOACTIVE MINERALS (NORM) IN MALAYSIA: ISSUE AND
PROSPECT OF GREEN APPROACH**

Amran Ab. Majid^{1*}

¹*NORM Research Group, Advance Science Centre, Faculty of Science and Technology, Universiti Kebangsaan
Malaysia, Bangi, Selangor.*

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Abstract

Malaysia has been involved in production of mineral containing naturally occurring radioactive minerals (NORM) for many decades. Malaysia has a significant deposit of thorium in its rare earth minerals such as monazite, xenotime and also in rare earth element (REE) extraction residue. Despite generating high economy revenue, this industry contribute several environmental problems especially during storage and disposal stages as the residue containing natural radioactivity may contributes a long term radiological risks to public health and environment. However, due to increasing interest in green and nuclear fuel technology worldwide, Malaysia has increased its special interest and research in production of rare earth elements (REE), uranium (U) and thorium (Th). The objectives of this research are to optimise the economy or benefit of these minerals and to develop a green technology to reduce the environmental and radiological impacts of the industry. This paper will revisit Malaysia's tin mine industry cycle and its associated issues and problems especially the radiological environmental impact. This paper will discuss the outcome of works carried out by NORM research group in UKM and Malaysia pertaining to NORM minerals and industry. This paper will also discuss the green approach involving acid digestion, solvent extraction for separation and purification of REE, U and Th developed by our group in processing of NORM minerals for the benefit of human and environment.

SPONSORS - ABSTRACTS

ANTON PAAR**MICROWAVE-ASSISTED SOLUTIONS IN THE LABORATORY -
POSSIBILITIES AND RESTRICTIONS**

David Reishofer
Anton Paar GmbH, 8054 Graz, Austria
david.reishofer@anton-paar.com



Over the last 30 years microwave technology has matured and stepped into several application fields in chemistry like synthesis, extraction and digestion. While in early days domestic ovens have been employed, bearing lots of issues and drawbacks, meanwhile dedicated reactors and individual options have been developed for convenient and efficient processing.

With up-to-date solutions for automation, efficient methods for high-throughput synthesis, extraordinary properties of silicon carbide materials, highly accurate temperature sensors and even possibilities to watch chemical reactions in a microwave reactor, microwave synthesis has been shifted to the next level, being fit for the challenges of the 21st century.

Herein we present a summary of applications showing the employment of tools for convenient, efficient and reproducible processing. But also the technical and applicative limits of microwave technology are discussed in order to give an overview about the possibilities and issues which one should keep in mind when using microwave assistance for chemical synthesis, extraction and digestion.

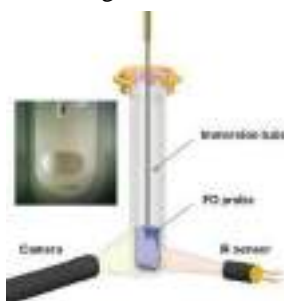


Figure 1. Schematic view of the reaction vessel and respective sensors in a microwave cavity

C. O. Kappe, Chem. Soc. Rev. 2013, 42, 4977

W. Chen, B. Gutmann, C. O. Kappe, ChemistryOpen 2012, 1, 39

L. Maiuolo et al., RSC Adv. 2017, 7, 4898

LYNAS MALAYSIA SDN BHD

ANALYTICAL CHEMISTRY, RARE EARTHS AND LYNAS

Richard James Amata,
Manager, Product Quality, Sales and Marketing,
Lynas MALAYSIA SDN BHD



Rare Earths, a set of 15 + 2 elements critical to recent advancements in science and technology, pose a unique challenge to the analytical sciences. This brief discussion will offer a viewpoint of how analytical science is applied at a rare earth industrial facility; e.g., types of analysis are conducted, technical difficulties of analysis, and a vision of the future for rare earth analysis.

PARALLEL SESSIONS

PARALLEL SESSION 1 (18th AUGUST 2018)

(10:45-12:30)

ROOM A: ENVIROMENTAL CHEMISTRY CHAIRPERSON: ASST. PROF. DR MOHD ARMI BIN ABU SAMAH		
CODE	NAME	TITLE
OEC01 10:45-11:00	MS. VIVIAN ZING TING LOH	REMOVAL OF Pb(II) FROM AQUEOUS SOLUTION BY PINEAPPLE PLANT STEM
OEC02 11.00-11.15	MS. SHARIFAH NUR ATIKAH SYED FIRZATUL AKBAR	PRELIMINARY STUDY OF MALACHITE GREEN ELECTROCHEMICAL SENSOR
OEC03 11.15-11.30	MRS. NURUL LATIFFAH ABD RANI	TREND AND MISSING DATA PREDICTION MODEL OF PM ₁₀ IN CENTRAL REGION USING ANN AND MLR
OEC04 11:30-11:45	DR. FIONA HOW NI FOONG	ANALYSIS OF CADMIUM AND CHROMIUM CONTENT IN RAW AND TREATED LEACHATE FROM JERANGAU-JABOR LANDFILL SITE, KUANTAN, PAHANG, MALAYSIA
OEC05 11:45-12:00	DR. AEMI SYAZWANI ABDUL KEYON	DISPERSIVE MICRO SOLID-PHASE EXTRACTION OF RHODAMINE 6G AND CRYSTAL VIOLET DYES IN TEXTILE WASTEWATER USING POLYPYRROLE-MAGNETITE AS ADSORBENT
OEC06 12:00-12.15	DR. MOHD FARID ISMAIL	THE EFFECT OF THE ANION PKA IN THE EFFICIENCY OF NAPHTHENIC ACID EXTRACTION FROM MODEL OIL BY 1-BUTYL-3-METHYL-IMIDAZOLIUM-BASED IONIC LIQUIDS
ROOM B: FOOD CHEMISTRY AND BIOTECHNOLOGY CHAIRPERSON: ASST. PROF. DR. NOR SALIYANA JUMALI		
CODE	NAME	TITLE
OFB01 10:45-11:00	MR. MUHAMMAD SHAHRAIN SHUHAIMEN	STATISTICAL ANALYSIS AND MOLECULAR DOCKING STUDY ON HALAL POTENTIAL ANTIOXIDANT FROM ANACARDIUM OCCIDENTALE FRUITS
OFB02 11:00-11:15	MRS. NOR FARAHYAH GHAZALI	ANTIOXIDANT ACTIVITY AND <i>IN VITRO</i> CYTOTOXICITY STUDY OF THE PHENOLIC COMPOUNDS FROM <i>PIPER SARMENTOSUM</i>
OFB03 11:15-11:30	MS. FARAH FARISHA MUSTAFA	LC-MS CHARACTERIZATION OF PHENOLIC COMPOUNDS AND ANTI-ACANTHAMOEBIC PROPERTIES OF <i>PIPER SARMENTOSUM</i> (KADUK) LEAVES METHANOLIC EXTRACT
OFB04 11:30-11:45	DR. SITI AMINAH SETU	PRODUCTION OF BACTERIAL-BASED VIOLACEIN NANOPARTICLES AND EVALUATION OF THEIR STABILITY USING SURFACTANT AS STABILIZER
OFB05 11:45-12:00	MS. NOR AINI NOH	DISCOVERY AND DELOPMENT OF HALAL PROTEASE FROM <i>SPONDIAS CYTHEREA</i> FOR MEAT TENDERIZATION
OFB06 12:00-12:15	DR. DARFIZZI DERAWI	SEPARATION OF UNSATURATED FATTY ACIDS FROM PALM STEARIN USING METHANOL-CRYSTALLISATION METHOD
OFB07 12:15-12:30	MS. NUR HUDA MOHD ZIN	COMPARISON OF THE ESSENTIAL OIL COMPONENTS IN FRESH PEELS OF LIME (<i>CITRUS AURANTIFOLIA</i>) EXTRACTED WITH SUPERCRITICAL FLUID EXTRACTION AND OTHER THREE TRADITIONAL EXTRACTION METHODS

ROOM C: MATERIAL CHEMISTRY		
CHAIRPERSON: ASST. PROF. DR. WAN KHARTINI BINTI WAN ABDUL KHODIR		
CODE	NAME	TITLE
OMC01 10:45-11:00	MS. MONICA LIMAU JADAM	FENOPROFEN INTERCALATED INTO LAYERED DOUBLE HYDROXIDE FOR CONTROLLED RELEASE DRUG DELIVERY STUDY
OMC02 11:00-11:15	DR. ZAEMAH BINTI JUBRI	SYNTHESIS AND CHARACTERIZATION OF NANOHYBRID ANTI-HYPERTENSIVE DRUG, CAPTOPRIL INTERCALATED INTO ZINC-ALUMINIUM LAYERED DOUBLE HYDROXIDE
OMC03 11:15-11:30	MR. AHMAD JAZMI ABDUL RAHMAN	PREPARATION AND CHARACTERIZATION OF S-QUINOLIN-2-YL-METHYLDITHIOCARBAZATE FUNCTIONALIZED MAGNETIC NANOPARTICLES
OMC04 11:30-11:45	MRS. NORIAH ABDUL RAHMAN	POTENTIAL OF NITROCHITOSAN SOLID BIOPOLYMER ELECTROLYTE
OMC05 11:45-12:00	MS. NOR ANIISAH HUSIN	SYNTHESIS OF MAGNETIC NANOPARTICLES DEEP EUTECTIC SOLVENT AS ADSORBENTS FOR REMOVAL OF DICLOFENAC IN ENVIRONMENTAL SAMPLES.
OMC06 12:00-12:15	DR.SITI NURUL AIN BINTI MD JAMIL	SYNTHESIS OF POROUS THIOAMIDE-MODIFIED POLY(ACRYLONITRILE-CO-DIVINYLBENZENE-80) SORBENTS FOR THE CAPTURE OF POLAR ANALYTES
OMC07 12:15-12:30	MS. SITI NUR FADHILAH SARDON	SYNTHESIS AND LIQUID CRYSTAL PROPERTIES OF NEW AZO-ESTER LINKED MATERIALS
ROOM D: ORGANIC/INORGANIC CHEMISTRY		
CHAIRPERSON: ASSOC. PROF. DR. SHAFIDA BINTI ABD HAMID		
CODE	NAME	TITLE
OOIC01 10:45-11:00	MS. NUR AFIQAH AHMAD	SPECTROSCOPY AND ANTIOXIDANT ACTIVITY OF SALICYLATE-BASED PROTIC IONIC LIQUIDS
OOIC02 11:00-11:15	MR. MUHAMMAD QUSYAIRI	SYNTHESIS, CHARACTERIZATION, REACTION MECHANISM AND THEORETICAL STUDY OF AN ANTIMICROBIAL INHIBITOR FROM HETEROAROMATICS BASED THIOSEMICARBAZONE
OOIC03 11:15-11:30	MRS. NUR MAISARAH SARIZAN	COMPARISON OF LABELLING REACTIONS FOR MONOSACCHARIDE COMPOSITION ANALYSIS USING HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY
OOIC04 11:30-11:45	MS. NURUL FAIEZIN ZUL	PHYSICOCHEMICAL INVESTIGATION OF TRIAZOLYL BENZOATE ANIONIC SURFACTANT AND ITS MIXTURE WITH GLYCOLIPIDS
OOIC05 11:45-12:00	MR. FAZHRUL HAQIMEE ZAIDON	SYNTHESIS AND CHARACTERIZATION OFN-SUBSTITUTED THIOSEMICARBAZONE DERIVATIVES AS CORROSION INHIBITORS FOR MILD STEEL IN 1 M HCL
OOIC06 12:00-12:15	MR. MUHAMMAD ASHRAF MOHD KAHAR	SUBSTITUENTS EFFECT OF SCHIFF BASE DERIVED FROM ANILINE AS CORROSION INHIBITOR ON MILD STEEL IN 1M HCL
ROOM E: ENVIROMENTAL CHEMISTRY		
CHAIRPERSON: ASST. PROF. DR. ASNOR AZRIN BIN SABUTI		
CODE	NAME	TITLE

OEC07 10:45-11:00	MRS.ISMALIZA ISMAIL	CORROSION INHIBITION BEHAVIOUR OF SODIUM DODECYLBENZENESULFONATES-ZINC SULFATE SYSTEM ON MILD STEEL IN NA ₂ CO ₃
OEC08 11:00-11:15	MR. HASSAN SHEIKH	HEMOLYMPH QUALITY OF WILD MALAYSIAN HORSESHOE CRAB (TACHYPLEUS GIGAS) FROM BALOK, KUANTAN
OEC09 11:15-11:30	DR. WAN MOHD AFIQ WAN MOHD KHALIK	C ₁₈ -CTA COMPOSITE FILM USAGE AS AN EXTRACTION SORBENT FOR CAFFEINE RESIDUE IN WATER ANALYSIS
OEC10 11:30-11:45	MRS. SITI NOOR SYUHADA MUHAMMAD AMIN	DETERMINATION OF AIRBORNE HEAVY METALS AND HEALTH RISK ASSESSMENT OF POPULATIONS EXPOSED TO METALS IN INDUSTRIAL AREA, GEBENG AND PAKA
OEC11 11:45-12:00	MR. YONG CHIN HONG	IS ORGANIC VEGETABLES IN MALAYSIA REALLY ORGANIC?

PARALLEL SESSION 2 (19th AUGUST 2018)**(10:45-12:30)**

ROOM A: ENVIRONMENTAL CHEMISTRY		
CHAIRPERSON: ASST. PROF. DR. MOHD FUAD MISKON		
CODE	NAME	TITLE
OEC12 10:45-11:00	MRS. SITI FATIMAH SAIPUDDIN	RADIOLOGICAL ASSESSMENT OF SOIL FROM PAYA BUNGOR, PAHANG, MALAYSIA
OEC13 11:00-11:15	MS. NURUL AMILIN SUPARDI	DITHIOCARBAMATE-IMMOBILIZED SILICA COATED MAGNETIC Fe ₃ O ₄ NANOPARTICLES FOR SOLID-PHASE EXTRACTION OF LEAD IN SHELLFISH
OEC14 11:15-11:30	ASSOC. PROF. DR. SUHAIMI SURATMAN	NUTRIENTS DISTRIBUTION IN BESUT RIVER BASIN, TERENGGANU, MALAYSIA
OEC15 11:30-11:45	ASSOC. PROF. DR. ONG MENG CHUAN	ACCUMULATION OF HEAVY METALS CONTENT IN COMMERCIAL CRAB COLLECTED FROM JOHOR STRAIT, MALAYSIA
OEC16 11:45-12:00	MS. NUR AMIRA HIDAYAH MADZLAN	SEASONAL CHANGES OF HEAVY METALS LEVEL IN SEDIMENT OF SETIU RIVER, TERENGGANU
OEC17 12:00-12:15	MS. NUR MARNI ZAINI	DISTRIBUTION OF HEAVY METALS CONCENTRATION IN RECENT SEDIMENTS AT MERANG RIVER, TERENGGANU, MALAYSIA
ROOM B: FOOD CHEMISTRY AND BIOTECHNOLOGY		
CHAIRPERSON: ASSOC. PROF. DR. DENY SUSANTI BINTI DARNIS		
CODE	NAME	TITLE
OFB08 10:45-11:00	ASSOC. PROF. DR. NORMAWATY MOHAMMAD-NOOR	QUANTIFICATION OF CARRAGEENAN IN <i>GRACILARIA CF. MANILENSIS</i> (RHODOPHYTA) EXPOSED TO DIFFERENT SALINITIES AND PH USING ATTENUATED TOTAL REFLECTION-FOURIER TRANSFORM INFRARED SPECTROSCOPY (ATR-FTIR)
OFB09 11:00-11:15	MS. NOR IZZAH MUKHTAR	APPLICATION OF DIRECT FLUORESCENCE-BASED LIVE/DEAD STAINING FOR ASSESSMENT OF ANTIFUNGAL ACTIVITY OF COCONUT OIL AGAINST <i>CANDIDA ALBICANS</i>
OFB10 11:15-11:30	MR. JING SHENG NG	THE AUTHENTICATION AND EVALUATION OF QUALITY OF CRUDE PALM OIL USING FOURIER TRANSFORM-INFRARED SPECTROSCOPY (FT-IR) AND FOURIER TRANSFORM-NEAR INFRARED SPECTROSCOPY (FT-NIR) COMBINED WITH CHEMOMETRIC ANALYSIS

OFB11 11:30-11:45	MR. MOHAMMED ABDULLAH JAINUL	ROLE OF L-GLUTAMINE IN THE <i>IN-VITRO</i> GROWTH OF HCT-8 AND HT-29 CELL LINES
OFB12 11:45-12:00	MRS. AQILAH NOOR BAHARI	DESIGN AND DEVELOPMENT OF HALAL NANOCOSMECEUTICAL CONTAINING HYDROLYSATE FROM ACTINOPYGA LECANORA
OFB13 12:00-12:15	MR. MOHD AIMAN BARUDIN	CHEMICAL COMPONENTS OF PCR IN 18S RRNA FOR CRYPTOSPORIDIUM DETECTION FROM RIVERS
OFB14 12:15-12:30	MS. NOOR ATIKAH AB AZIZ	DESIGN AND DEVELOPMENT OF NANO-SIZED NIOSOMES CONTAINING COLLAGEN HYDROLYSATE FROM LOCAL JELLYFISH (RHOPILEMA HISPIDUM) WITH POTENTIAL ANTIOXIDANT AND TYROSINASE-INHIBITING ACTIVITIES
OFB15 12:30-12:45	MR. IBRAHEEM AWARD	CYTOTOXIC EFFECT OF THE CHEMICAL CONSTITUENTS FROM THE RHIZOMES OF <i>BOESENBERGIA ROTUNDA</i>
ROOM C: MATERIAL CHEMISTRY CHAIRPERSON: ASST.PROF. DR WAN ZURINA SAMAD		
CODE	NAME	TITLE
OMC08 10:45-11:00	MS. NURUL FAKHRIAH ISMAIL	PREPARATION AND CHARACTERISATION OF HYDROXYAPATITE EXTRACTED FROM FISH SCALE WASTE FOR THE REMOVAL OF GALLIC ACID AS INHIBITOR IN BIOFUEL PRODUCTION
OMC09 11:00-11:15	MS. SOPIA SAGING	SYNTHESIS OF LIQUID CRYSTALS WITH LATERAL METHYL GROUP AND THEIR MESOMORPHIC PROPERTIES
OMC10 11:15-11:30	MS. NORAMIRA SAAD	ELECTROCHEMICAL PROPERTIES OF MESOPOROUS SILICA - CARBON ELECTRODE
OMC11 11:30-11:45	DR. HASLINA AHMAD	ENHANCED CYTOTOXICITY OF RUTHENIUM COMPLEX CARRIED BY MESOPOROUS SILICA NANOPARTICLES
OMC12 11:45-12:00	MS. SITI FATIMAH BINTI MD HANAFIAH	EXTRACTION AND CHARACTERIZATION OF MICROFIBRILLATED AND NANOFIBRILLATED CELLULOSE FROM OFFICE PAPER WASTE
OMC13 12:00-12:15	MR. MOHAMAD WAFIUDDIN BIN ISMAIL	SYNTHESIS OF FOUR ARMS STAR POLYMER FOR HYDROGEL FORMULATION
ROOM D: ORGANIC AND INORGANIC CHEMISTRY CHAIRPERSON: ASSOC.PROF. DR. NURZIANA NGAH		
CODE	NAME	TITLE
OOIC07 10:45-11:00	MS. UMIE FATIHAH MOHAMAD HAZIZ	NON-SYMMETRICALLY SUBSTITUTED BIS-BENZIMIDAZOLIUM SALTS AND THEIR RESPECTIVE DINUCLEAR SILVER(I)-NHC COMPLEXES: SYNTHESIS AND ANTIBACTERIAL ACTIVITIES
OOIC08 11:00-11:15	DR. FAZIRA ILYANA ABDUL RAZAK	INVESTIGATION OF RUTHENIUM ALKYNYL COMPLEXES FOR NONLINEAR OPTIC APPLICATION USING COMPUTATIONAL METHOD
OOIC09 11:15-11:30	MR. MUHAMAD AZWAN HAMALI	ONE POT GREEN SYNTHESIS AND ANTIMICROBIAL STUDIES OF SALICYLALAZINE DERIVATIVES SCHIFF BASE
OOIC10 11:30-11:45	DR. MOHAMED IBRAHIM MOHAMED TAHIR	SYNTHESIS, CHARACTERISATION & CYTOTOXICITY STUDY OF BENZYL 2-((1E,4E)-1,5-BIS(4-BROMOPHENYL)PENTA-1,4-DIEN-3-YLIDENE)HYDRAZINECARBODITHIOATE & BENZYL 2-((1E,4E)-1,5-BIS(4-CHLOROPHENYL)PENTA-1,4-DIEN-3-YLIDENE)HYDRAZINECARBODITHIOATE AND THEIR NI(II), CU(II), FE(II), ZN(II), & CD(II) COMPLEXES
OOIC11 11:45-12:00	MR. MOHAMAD NOR AMIRUL AZHAR KAMIS	CRYSTAL GROWTH AND PHYSICAL CHARACTERIZATION OF NICOTINAMIDE CRYSTALLIZED WITH CINNAMIC ACID

001C12 12:00-12:15	MR. KEN MIN LIEW	SYNTHESIS AND CHARACTERISATION OF FERROCENE-INDOLE DERIVATIVES VIA SIMPLE ESTERIFICATION AS HELA INHIBITOR
ROOM E: ANALYTICAL CHEMISTRY CHAIRPERSON: ASST.PROF. DR. ERNA NORMAYA BT ABDULLAH		
CODE	NAME	TITLE
OAC01 10:45-11:00	ASSOC. PROF. DR. SHARIFAH MOHAMAD	WASTES FROM KITCHEN: A PROMISING MATERIALS FOR ANALYTICAL SAMPLE PREPARATION
OAC02 11:00-11:15	MRS. NURUL AMIRAH BAHARU	CHEMOSENSOR DEVELOPMENT USING 2-ACETILPYRROLE THIOSEMICARBAZONE FOR Cu ²⁺ ION RECOGNITION IN AQUEOUS MEDIUM: EXPERIMENTAL AND THEORETICAL STUDIES
OAC03 11:15-11:30	MS. NADHIRATUL-FARIHIN SEMAIL	ELECTROKINETIC SUPERCHARGING IN CAPILLARY ELECTROPHORESIS FOR ONLINE PRECONCENTRATION OF 5-FLUOROURACIL AND ITS METABOLITES IN HUMAN PLASMA
OAC04 11:30-11:45	MS. NURHAKIMAH ISMAIL	CHEMOSENSOR DEVELOPMENT OF Cu ²⁺ RECOGNITION USING 1,5-DIPHENYLCARBAZONE: OPTIMIZATION, COSMO-RS AND DFT STUDIES.

PARALLEL SESSION 3 (19th AUGUST 2018)**(15:05-16:05)**

ROOM A: ENVIRONMENTAL CHEMISTRY CHAIRPERSON: ASST.PROF. DR. FIONA HOW NI FOONG		
CODE	NAME	TITLE
OEC18 15:05-15:20	ASSOC. PROF. DR. NIK AHMAD NIZAM	REMOVAL OF HERBICIDE PARAQUAT BY CETYLTRIMETHYL AMMONIUM BROMIDE MODIFIED PINEAPPLE LEAVES
OEC19 15:20-15:35	MRS.SITI UMI KALTHUM AB WAHAB	THE DETERMINATION OF SELECTED ELEMENTS FOUND IN SAMPLES COLLECTED FROM RIVERS IN GEBENG AREA
OEC20 15:35-15:50	DR. HANI KARTINI AGUSTAR	ABUNDANCE OF PROTOZOA AND HAEMOPARASITES IN ANURANS FROM HIGHLAND AND LOWLAND GOLF COURSES
OEC21 15:50-16:05	DR. KHAIRIATUL MARDIANA JANSAR	DETERMINATION OF GLYPHOSATE AND AMINOMETHYLPHOSPHONIC ACID AND GLYPHOSATE POTENTIAL TO GROUNDWATER POLLUTION
ROOM B: MATERIAL CHEMISTRY CHAIRPERSON: ASST.PROF.DR. MOHAMMAD NORAZMI BIN AHMAD		
CODE	NAME	TITLE
OMC14 15:05-15:20	MR. SHARIL FADLI MOHAMAD ZAMRI	MORPHOLOGICAL AND IONIC CONDUCTIVITY OF TiO ₂ FILLED PS/NR BLEND ELECTROLYTES
OMC15 15:20-15:35	DR. MUGGUNDHA RAOOV RAMACHANDRAN	DEVELOPMENT OF IONIC LIQUID BASED MAGNETIC NANOPARTICLES FOR THE EXTRACTION OF ORGANIC COMPOUNDS FROM VARIOUS MATRIXES
OMC16 15:35-15:50	DR. ZULKIFLI MERICAN	CHARACTERIZATION AND ANALYSIS OF HIGH DENSITY POLYETHYLENE AS A PIPE LINER SUBJECTED TO FIELD OPERATING CONDITION
OMC17 15:50-16:05	MS. NUR AMIRAH SYAHIRAH IBRAHIM	PREPARATION AND CHARACTERISATION OF SOL-GEL HYBRID SORBENT METHYLTRIMETHOXYSILANECHLOROPROPYLTRIETHOXYSILANE FOR SOLID PHASE EXTRACTION

ROOM C: MATERIAL CHEMISTRY CHAIRPERSON: ASST.PROF.DR. WAN HAZMAN BIN DANIAL		
CODE	NAME	TITLE
OMC18 15:05-15:20	MR. MUHAMMAD AZAM MUHAMMAD ZAKI	ONE STEP ACTIVATION AND RECYCLABILITY OF KOH AND CAO MODIFIED CARBON IN TRANSESTERIFICATION OF RICE BRAN OIL
OMC19 15:20-15:35	MRS. MIFTAKHUL JANNATIN	DEGRADATION OF CHLORAMPHENICOL USING GRAPHENE OXIDE FROM BAGASSE- Fe_3O_4
OMC20 15:35-15:50	MS. KASTURI GOPAL	ACTIVATED CHARCOAL COATED WITH NONIONIC SILICONE SURFACTANT ENHANCED WITH MAGNETIC NANO PARTICLES FOR THE REMOVAL OF PHENOLIC COMPOUNDS IN AQUEOUS SAMPLES USING UV-VIS SPECTROSCOPY.
OMC21 15:50-16:05	DR. EMMANUEL JOSEPH	INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS OF INTEREST ELEMENTS IN FARMLANDS AT THE CENTRAL AREA OF KATSINA STATE, NIGERIA
ROOM D: ANALYTICAL CHEMISTRY CHAIRPERSON: ASST.PROF.DR. NURUL IMAN BT AMINUDIN		
CODE	NAME	TITLE
OAC05 15:05-15:20	MS. NURUL RAIHANA AZHARI	SIMULTANEOUS ENANTIOMERIC RESOLUTION OF IMIDAZOLE ANTIFUNGAL AGENTS USING HYDROXYPROPYL-B-CYCLODEXTRIN AS CHIRAL SELECTOR IN CAPILLARY ELECTROPHORESIS
OAC06 15:20-15:35	MS. IRDA HASLINDA HASSAN	DEVELOPMENT AND VALIDATION OF HPLC METHOD FOR SIMULTANEOUS DETERMINATION OF CARBAMAZEPINE AND GABAPENTIN IN FIXED-DOSE COMBINATION
OAC07 15:35-15:50	MS. MAIZATUL NAJWA BINTI JAJULI	ELECTROCHEMICAL LIQUID-LIQUID EXTRACTION OF PHARMACEUTICAL COMPOUNDS
OAC08 15:50:16:05	ASSOC. PROF. DR. IBRAHIM SHOGAR	THE ETHICAL CONCERNS OF BIOANALYTICAL CHEMISTRY: THE CASE OF FORENSIC SCIENCE
OAC09 16:05-16:20	MR. BOON YIH HUI	FABRICATION OF MAGNETIC POLY(B-CYCLODEXTRIN FUNCTIONALIZED IONIC LIQUID) NANOCOMPOSITES AND ITS APPLICATION IN THE MAGNETIC SOLID PHASE EXTRACTION OF POLYCYCLIC AROMATIC HYDROCARBONS FROM RICE SAMPLES
ROOM E: CATALYSIS CHAIRPERSON: ASST.PROF.DR. ROSLIZA BINTI MOHD SALIM		
CODE	NAME	TITLE
OC01 15:05-15:20	DR. SITI KAMILAH CHE SOH	SYNTHESIS, CHARACTERIZATION AND CATALYTIC APPLICATION OF SYMMETRICAL PALLADIUM(II) N_2O_2 - SCHIFF BASE TOWARD MIZOROKI-HECK REACTION
OC02 15:20-15:35	DR. NORLI ABDULLAH	SIZE-CONTROLLED SYNTHESIS OF PALLADIUM NANOPARTICLES SUPPORTED ON TITANIA FOR HYDROGENATION REACTION
OC03 15:35-15:50	DR. SUSILAWATI TOEMEN	A COMPARATIVE STUDY ON THE STRUCTURE-ACTIVITY RELATIONSHIP OF $Ru/M^*/Ce/Al_2O_3$ PROMOTED WITH MG AND MN FOR CO_2/H_2 METHANATION REACTION
OC04 15:50-16:05	MR. MOHAMAD IMRAN FIRDAUS BIN MHD SAWAL	GLYCEROL DEGRADATION WITH ABSENCE OF EXTERNAL HYDROGEN GAS BY USING WASTE EGGSHELL AS HETEROGENEOUS CATALYST

POSTER SESSIONS

CODE	TITLE
PEC01	ELECTROCHEMICAL TREATMENT OF AQUEOUS C. I. REACTIVE BLUE 21 AND SYNTHETIC TEXTILE EFFLUENT USING METAL/GRAPHITE-POLYVINYL CHLORIDE COMPOSITE ELECTRODE <i>Norazzizi Nordin, Mohamad Anis Farith Pisal, Nur Izzatie Hannah Razman, Mohd Lokman Ibrahim</i>
PEC02	A REVIEW ON THE ACCUMULATION OF HEAVY METALS IN COASTAL SEDIMENT OF PENINSULAR MALAYSIA <i>Kamaruzzaman, B.Y., Zuraidah, M.A, Akbar John, B.</i>
PEC03	REMOVAL OF Cu AND Pb FROM AQUEOUS SOLUTION USING CORN LEAVES (<i>Zea Mays</i>) AS ADSORBENT <i>Rosliza Mohd Salim, Siti Hajar Abu Bakar</i>
PEC04	SEDIMENT QUALITY ASSESSMENTS IN RELATION TO SOCIO-ECONOMIC DEVELOPMENT IN KAMPUNG TEKEK, TIOMAN ISLAND, PAHANG DURING SURVEY IN AUGUST 2015 <i>Asnor Azrin Sabuti, Mohd Fuad Miskon, Nik Hani Shahira Nik Shirajuddin, Nur Sakinah Abdul Razak, Zaleha Kassim</i>
PEC05	SEASONAL INFLUENCES ON THE LEVELS OF PARTICULATE METALS IN KUANTAN RIVER, EAST COAST MALAYSIA USING PRINCIPAL COMPONENT ANALYSIS <i>Fikriah Faudzi, Kamaruzzaman Yunus, Mohd Fuad Miskon, Asnor Azrin Sabuti, Azman Azid</i>
PEC06	DEGRADATION OF METHYL ORANGE BY USING SILVER PHOSPHATE/TITANIUM DIOXIDE PHOTOCATALYST <i>Noor Izznin Najiah Lansir, Nur Amalina Abdul Aziz, Abdul Halim Abdullah</i>
PEC07	PENENTUAN KEPEKATAN LOGAM BERAT DALAM SEDIMEN DI MUARA SUNGAI KEMAMAN, TERENGGANU <i>Samsuddin, A.A., Suratman, S., Shazili, N.A.M, Nor Antonina, A., Mohammed Faizal, A.R</i>
PEC08	REMOVAL OF CRUDE OIL FROM AQUEOUS SOLUTION BY BIVALVE SHELL AS LOW-COST ADSORBENT <i>Muhammad Farhan Hanafi, Muhammad Haikal Rosli, Norzahir Sapawe</i>
PEC09	WATER QUALITY AND ANTROPHOGENIC POLLUTANTS DETERMINATION IN SUNGAI BERTAM, CAMERON HIGHLANDS, PAHANG. <i>Khairiatul Mardiana Jansar, Ismail Sahid, Siti Nur Ain Suhaimi, Muhamad Safwan Ishak</i>
PFB01	ULTRASOUND ASSISTED DISPERSIVE LIQUID-LIQUID MICRO EXTRACTION (USADLLME) FOR THE DETERMINATION OF BIOGENIC AMINES IN FOODS <i>Mardiana Saaid, Solehatum Mhd Bani</i>
PFB02	ANDIDA RUGOSA LIPASE IMMOBILIZED ON DIETHYLAMINOETHYL-CELLULOSE (DEAE) FOR ESTERIFICATION OF OLEIC ACID AND BIOALCOHOL <i>Mohd Basyaruddin Abdul Rahman, Emilia Abdumalek, Muhammad Alif Mohammad Latiff</i>
PMC01	TERNARY PHASE BEHAVIOUR OF WATER/GLYCOLIPID/OIL SYSTEM <i>Nurul Shahidah M Shahripoddin, Noraini Ahmad, Norazlinaliza Salim</i>
PMC02	CARBOXYMETHYL SAGO STARCH/POLY(ETHYLENE OXIDE) HYDROGEL NANOFIBERS AND ITS CONTROLLED RELEASE BEHAVIOR <i>Norizah Abdul Rahman, Nurul Husna Rosdi, Norhashidah Talib, Norzita Yacob, Mohd Zobir Hussein</i>
PMC03	BIPHASIC NANOHYBRID OF LAYERED DOUBLE HYDROXIDE INTERCALATED WITH 4-CHLOROPHENOXYACETATE AND 2,4,5-TRICHLOROPHENOXYACETATE HERBICIDES <i>S.H. Sarijo, M.Z. Hussein, Z. Zainal</i>
PMC04	ELECTROSPUN POLY (VINYL ALCOHOL) NANOFIBERS DOPED WITH MESOPOROUS SILICA NANOPARTICLES FOR CONTROLLED RELEASE OF METHYLENE BLUE <i>Haslina Ahmad, Nur Izzah Md Fadilah, Mohd Firdaus Abd Rahman, Norizah Abdul Rahman</i>
PMC05	SYNTHESIS OF MESOPOROUS SILICA NANOPARTICLE FROM BAGASSE ASH FOR METHYLENE BLUE DYE REMOVAL <i>Norzahir Sapawe, Mohd Zulkhairi Zakaria, Muhammad Farhan Hanafi</i>
PMC06	CRYSTALLISATION VIA MELTING <i>Azaima Razali, C.Patrick Royall</i>
POIC01	SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL STUDY OF ACRIDINE IMIDAZOLIUM SALT <i>Olla Sharhan, Thorsten Heidelberg, Najiahah Mohd Hashim</i>

POIC02	EVALUATING THE INHIBITION OF THE ENZYME α -GLUCOSIDASE BY IMINOSUGAR INTERMEDIATES OF DEOXYNOJIRIMYCIN <i>Yong Wai Haan, Hussein Mahmood Ahmed Al-Bajalan, Edison Eukun Sage, Dharshini Elangovan, Noorliana Mat Yajit, Nur Maisarah Sarizan, Siti Aishah Hasbullah, Nicole Zitzmann, J.L. Kiappes, Nor Hadiani Ismail, Mukram Mohamed Mackeen</i>
POIC03	SYNTHESIS OF AMINOANTHRAQUINONE DERIVATIVES <i>Siti Mariam Mohd Nor, Siti Fadilah Juhan, Saripah Salbiah Syed Abdul Azziz</i>
POIC04	SYNTHESIS, MOLECULAR DOCKING OF 5-ACETYL-4-METHYLTHIAZOLE DERIVATIVES AS ANTIMICROBIAL AGENTS <i>Iswatun Hasanah Abdullah Ripain, Norashikin Roslan, Nurul Shazana Norshahimi, Siti Salwa Mohamed Salleh, Noraslinda Mohammad Bunori, Nurziana Ngah</i>
POIC05	PALM OIL AS ALTERNATIVE BIOLUBRICANTS FOR IMPROVING TRIBOLOGICAL HYDRODYNAMIC <i>Norzahir Sapawe, Muhammad Farhan Hanafi, Syahrullail Samion</i>
POIC06	SYNTHESIS AND STRUCTURAL CHARACTERISATION OF LANTHANIDE METAL-ORGANIC FRAMEWORKS CONTAINING DICARBOXYLIC ACID LIGANDS <i>Nurul Natasya Muhamad Khirudin, Nurul Nabihah Mohamad Ishak, M. Ibrahim M. Tahir, Thahira B.S.A. Ravoof</i>
PC01	REDUCED TiO ₂ MODIFIED POLY (ETHER SULFONE) FILM: A NEW STRATEGY FOR PHOTOCATALYST IMMOBILIZATION <i>Zul Adlan Mohd Hir, Abdul Halim Abdullah1, Zulkarnain Zainal, Hong Ngee Lim</i>
PC02	GLYCEROL ETHERIFICATION FOR PRODUCTION OF FUEL ADDITIVE USING ACTIVATED BENTONITE CATALYST <i>Noraini Hamzah, Wan Zurina Samad, Mohd Ambar Yarmo</i>
PC03	ELECTROBIOSYNTHESIS OF NiO USING RAMBUTAN LEAVES FOR PHOTODEGRADATION OF REMAZOL BRILLIANT BLUE DYE <i>Norzahir Sapawe, Azizami Radin, Muhammad Farhan Hanafi</i>
PC04	PHOTODEGRADATION OF PHENOL AND METHYL ORANGE USING t-EGZrO ₂ NANOPARTICLES CATALYST <i>Muhammad Farhan Hanafi, Norzahir Sapawe</i>
PC05	ELECTROSYNTHESIS OF SILVER OXIDE DEPOSITED ONTO HOTSPRING MUD WITH ENHANCED DEGRADATION OF CONGO RED <i>Muhammad Farhan Hanafi, Norzahir Sapawe</i>
PCS01	AN OPTICAL SENSOR BASED ON GRAPHENE QUANTUM DOTS FOR HYDROGEN PEROXIDE DETECTION <i>Amiruddin Ashil Mastar, Jaafar Abdullah, Nor Azah Yusof, Yap Wing Fen</i>
PPN01	PREPARATION AND CHARACTERIZATION OF INCLUSION COMPLEXES BETWEEN PIOGLITAZONE AND NATIVE β -CYCLODEXTRIN AND β -CYCLODEXTRIN FUNCTIONALIZED IONIC LIQUID <i>Nur Najihah Md Zuki, Nurul Yani Rahim</i>
PPN02	EXCIPIENTS SELECTION AS AEROSOLIZED NANOCOLLOIDAL CARRIER SYSTEM LOADED QUERCETIN FOR PULMONARY DELIVERY OF LUNG CANCER <i>Noor Hafizah Arbain, Norazlinaliza Salim, Wong Tin Wui, Mohd Basyaruddin Abdul Rahman</i>
PPN03	MODELLING INHIBITION BY ROSMARINIC ACID ON PORCINE PANCREATIC LIPASE <i>Muhammad Alif Mohammad Latif, Muhammad MuiZ Mohd Zuki, Fairalniza Mohd Shariff, Mohd Basyaruddin Abdul Rahman</i>
PNP01	ANTIBACTERIAL AND ANTIOXIDANT ACTIVITIES OF EXTRACTS FROM <i>CALOPHYLLUM FERRUGINEUM</i> AND <i>CALOPHYLLUM INCRASSATUM</i> <i>Nurul Iman Aminudin, Farediah Ahmad, Muhammad Taher, Deny Susanti</i>
PNP02	PHYTOCHEMICAL SCREENING AND ANTIOXIDANT ACTIVITY OF <i>PSIDIUM GUAJAVA</i> <i>Nor Akmalazura Jani, Nurul Alia Ahmad Aziz, Nurul Iman Aminudin</i>
PNP03	COMPARISON OF EXTRACTION TECHNIQUES FOR THREE <i>CALOPHYLLUM</i> SPECIES AND THEIR ANTIOXIDANT ACTIVITY <i>Siti Nurhafizah Ramli, Nurul Iman Aminudin, Farediah Ahmad, Deny Susanti</i>
PCC01	FORMULATION AND EVALUATION OF PVA/PEG PEEL-OFF MASK CONTAINING RICH FRACTION OF <i>CENTELLA ASIATICA</i> AND <i>CUCUMIS SATIVUS</i> EXTRACT FOR ANTI-AGEING <i>Anis Natasha Shafawi, Muhammad Taher Bakhtiar, Deny Susanti Darnis</i>
PRN01	CUMENE HYDROPEROXIDE AS A CO-SENSITIZER IN THE PREPARATION OF PREVULCANIZED NATURAL RUBBER LATEX VIA COMBINATION OF GAMMA RADIATION AND PEROXIDE VULCANIZATIONS <i>Sofian Ibrahim, Khairiah Haji Badri, Chantara Theyy Ratnam, Chai Chee Keong, Noor Hasni M. Ali, Mohd Noorwadi Mat Lazim</i>

PARALLEL SESSIONS ABSTRACTS

REMOVAL OF Pb(II) FROM AQUEOUS SOLUTION BY PINEAPPLE PLANT STEM

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Abstract

The excessive release of lead (Pb) ions into water stream and large production of agricultural wastes cause water and land pollutions. Adsorption is useful in eliminating Pb(II) from water environment. The potential use of agricultural waste, pineapple plant stem as adsorbent to reduce the amount of Pb(II) in aqueous solutions was investigated. The material was modified with oxalic acid (OA) to improve the adsorption efficiency of Pb(II). Adsorption isotherms were determined for the adsorption of Pb(II) on natural and modified pineapple plant stem from aqueous solution in batch studies. The adsorption equilibrium data were found to fit well with the Langmuir isotherm model. Maximum adsorption capacities of Pb(II) at 12.85 and 25.29 mg/g were achieved by natural and OA modified pineapple plant stem, respectively. The adsorption capacity of Pb(II) on pineapple plant stem depends considerably on the solution pH, where the adsorption capacity increased with increasing solution pH from 1 to 4. The adsorption kinetics of pineapple plant stem was studied at different metal ion concentrations (25 – 150 ppm). The results showed an increase in Pb(II) uptake with raising initial metal ion concentration. The kinetic data were found to follow the pseudo-second order model.

Keywords: Adsorption; Pineapple plant stem; Oxalic Acid; Lead

PRELIMINARY STUDY OF MALACHITE GREEN ELECTROCHEMICAL SENSOR

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Abstract

Malachite green is widely used in aquaculture and textile industry. However, malachite green is carcinogenic, mutagenic and teratogenic. Therefore, a chemical sensor will be developed to detect malachite green in water. Screen printed electrode was coated with poly(acrylamide-co-ethyl methacrylate) (p(AAm-co-EMA)/silver nanowire (AgNWs) to investigate its potential as a film for chemical sensor. The film was synthesized by using photopolymerization technique and characterized by Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR), ¹H Nuclear Magnetic Resonance (NMR) Field Emission Scanning Electron Microscopy/Electron Dispersive X-Ray Analysis (FESEM/EDX) and Thermogravimetric Analysis (TGA). Peak of –CO was shown in FTIR spectra which confirmed the copolymerization was successful. Furthermore, NMR spectrum proved the FTIR spectrum. While, the presence of silver nanowire (AgNWs) in poly(acrylamide-co-ethyl methacrylate) (p(AAm-co-EMA)) can be seen in EDX spectrum. Thermal decomposition temperature of the film was around 400 °C. In conclusion, p(AAm-co-EMA)/AgNWs film was suitable to use for developing malachite green sensor.

Keywords: Malachite green; electrochemical sensor; photopolymerization; silver nanowires

TREND AND MISSING DATA PREDICTION MODEL OF PM₁₀ IN CENTRAL REGION USING ANN AND MLR

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Abstract

Increasing concentrations of PM₁₀ are identified to give harmful affect to human health. Trend analysis of PM₁₀ for the last six years starting from 2010 until 2015 in Central region Malaysia shows increased and decrease concentration of the PM₁₀ pollutant. Some of the PM₁₀ concentration exceeds the Malaysia Ambient Air Quality Guidelines which is 150 µg/m³. In addition, the high Air Pollution Index (API) was assign to the high PM₁₀ concentrations which was the main pollutant in the air. Despite their importance in determining the API level in Malaysia, there are some missingness data of PM₁₀ detected for certain day perhaps due to the failure of the equipment. Therefore, missing data prediction of PM₁₀ may give vital information with the intention of taking actions for the public and government especially regarding the API levels which is the main indicator used to decide the level of air quality. There are eight continuous air quality monitoring station in Central region which located in Selangor (Klang, Petaling Jaya, Banting, Shah Alam, Kuala Selangor) and Kuala Lumpur (Batu Muda, Putrajaya, Cheras). Meteorological and pollutant parameters analyzed for the missing data prediction model of PM₁₀ in this study include wind speed, wind direction, temperature, humidity and NO_x, NO, SO₂, NO₂, CO, O₃ respectively. In this study, Artificial Neural Network (ANN) and Multiple Linear Regression (MLR) models conjointly PCA were used to predict the concentration of PM₁₀ missing data in Central region Malaysia. The results obtained from trend analysis signified that each continuous air quality monitoring station in Central region give different concentrations of PM₁₀ with Klang continuous air quality monitoring station shows the highest concentration which is 581 µg/m³ in June 2013. This possibly owing to the transboundary pollution from the great land and forest fires in Sumatra and Kalimantan, Indonesia especially during the southwest monsoon (May until September) which is contributed to the worsen air quality in Malaysia. Furthermore, locality of Klang continuous air quality monitoring station and activities done within this region also give high PM₁₀ concentration. For the missing data prediction model, inputs to the models obtained from the Principal Component Analysis (PCA) include pearson coefficient with moderate correlation (0.5-0.75) and pearson coefficient with high correlation (>0.75). All parameters (wind speed, wind direction, temperature, humidity, NO_x, NO, SO₂, NO₂, CO, O₃) also being used as inputs besides inputs obtained from PCA. Input parameters obtained from pearson coefficient with moderate correlation (0.5 - 0.75) and high correlation (>0.75) seems not suitable to be applied onto Central regions whether by ANN or MLR model. The results showed that all parameters as inputs use for ANN appeared to be promising with R² up to 0.5343 and RMSE up to 23.95. However, results obtained from MLR analysis using the same input parameters shows less accurate than ANN with R² and RMSE value obtained are 0.3478 and 27.65 respectively. It is concluded that ANN is capable to predict the missing data concentration of PM₁₀ rather than MLR model.

Keywords: missing data prediction model, PM₁₀, ANN, MLR, PCA, Malaysia

ANALYSIS OF CADMIUM AND CHROMIUM CONTENT IN RAW AND TREATED LEACHATE FROM JERANGAU-JABOR LANDFILL SITE, KUANTAN, PAHANG, MALAYSIA

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Abstract

Raw and treated leachate collected from Jerangau-Jabor Landfill Site (JJLS), Kuantan, Pahang, Malaysia were analyzed for the content of cadmium and chromium. The presence of these heavy metals was monitored and analyzed using Flame Atomic Absorption Spectroscopy (FAAS). The metal analyses results were compared with standard value limits from the Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009, Malaysian Environmental Quality Act 1974 (Act 127) set by the Department of Environment, Ministry of Natural Resources and Environment, Malaysia. All metal concentrations in the raw leachate were significantly higher than the treated leachate. The concentration of the cadmium in the treated leachate were found to be within the permissible standard limit and showed no potential pollution risk. However, the concentration of chromium in the treated leachate remains high and above the permissible limit stipulated in the regulation as given for chromium hexavalent and chromium trivalent, which was 0.05 mg/L and 0.20 mg/L, respectively. It can be concluded that, a proper treatment for heavy metals such as chromium removal is necessary at JJLS.

Keywords: Raw and treated leachate; Landfill site; Cadmium; Chromium

DISPERSIVE MICRO SOLID-PHASE EXTRACTION OF RHODAMINE 6G AND CRYSTAL VIOLET DYES IN TEXTILE WASTEWATER USING POLYPYRROLE-MAGNETITE AS ADSORBENT

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Abstract

The batik textile industry consumes a large quantity of dyes that requires large volumes of water for washing. The problem arises when this industry discharges wastewater effluents containing harmful dyes into the environment without treatment. Their analysis becomes a major challenge since they also have a large variety of functional groups contributing to their diverse properties. For this purpose, polypyrrole-magnetite (PPy-Fe₃O₄) dispersive micro-solid phase extraction (PPy-Fe₃O₄-D-μ-SPE) method combined with UV-visible (UV-Vis) spectrophotometry was developed for the determination of selected cationic dyes in textile wastewater. PPy-Fe₃O₄ was used as adsorbent due to its thermal stability, magnetic properties and capability of adsorbing Rhodamine 6G (Rh 6G) and crystal violet (CV). Sample pH, amount of adsorbent, extraction time and type of desorption solvents governing the efficacy of extraction method were optimized. The optimum PPy-Fe₃O₄-D-μ-SPE conditions were at sample pH 8, 60 mg of PPy-Fe₃O₄ adsorbent, 5 min of extraction time and ACN as the desorption solvent. Under the optimized conditions, PPy-Fe₃O₄-D-μ-SPE-UV-Vis method showed good linearity in the range of 0.05-7 mg L⁻¹ (R² > 0.9980). The method also showed good LOD for the dyes (0.05 mg L⁻¹) and good analyte recoveries (97.4-111.3%) with relative standard deviations (RSD) < 10%. The method was successfully applied to the analysis of dyes in textile wastewater samples where the concentration found was 1.03 mg L⁻¹ (RSD of 7.9%) and 1.13 mg L⁻¹ (RSD of ±4.6%) for Rh 6G and CV, respectively. The results obtained revealed the applicability of PPy-Fe₃O₄ for the analytical problem.

Keywords: Dispersive micro-solid phase extraction; organic-inorganic hybrid adsorbent; cationic dyes; textile wastewater

THE EFFECT OF THE ANION pK_a IN THE EFFICIENCY OF NAPHTHENIC ACID EXTRACTION FROM MODEL OIL BY 1-BUTYL-3-METHYL-IMIDAZOLIUM-BASED IONIC LIQUIDS

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Abstract

The possible utility of naphthenic acid (NA) as an important raw material in various industries makes the recovery of NA from crude oil an important process. Liquid-liquid extraction using ionic liquid (IL) appears to be a promising method. This is because IL is considered a versatile “designer solvent” with the possibility of fine tuning its properties as desired, while at the same time being the green solvent that will not pollute the environment. However, the factors that affect NA extraction efficiency by different ILs are not known. This impedes the design of the best IL for optimal extraction of NA from crude oil. In this work the extraction efficiency of NA against the pK_a of the anion of the 1-butyl-4-methyl imidazolium (BMIM)-based ILs are investigated. The anions investigated are trifluoromethanesulfonate (SO₃CF₃⁻), tetrafluoroborate (BF₄⁻), thiocyanate (SCN⁻), and dicyanamide (C₂N₃⁻) with respective pK_a values of -14.70, -0.44, 1.10 and 9.21. From the experiment, it is found that the highest percentage of NA removal by BMIM-based IL follows the order of [BMIM] [BF₄⁻] < [BMIM] [SCN⁻] < [BMIM] [SO₃CF₃⁻] < [BMIM] [C₂N₃⁻]. This order does not conform to the order of the anion pK_a values. Thus it is concluded that the pK_a of the anion does not influence the extraction efficiency of NA from model oil.

Keywords: Ionic liquid, naphthenic acid, extraction, BMIM, pK_a, anion.

CORROSION INHIBITION BEHAVIOUR OF SODIUM DODECYLBENZENESULFONATES-ZINC SULFATE SYSTEM ON MILD STEEL IN NaCl

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Abstract

The corrosion inhibition and adsorption behavior of sodium dodecylbenzenesulfonates surfactant alone and in the presence of various concentration of zinc sulfate on mild steel in 0.05 M NaCl at 25 °C was investigated using electrochemical impedance spectroscopy (EIS), polarization measurement, fourier transform infrared spectroscopy (FTiR) and determination of thermodynamic/kinetic parameters. The inhibition efficiency (IE) of sodium dodecylbenzenesulfonates is enhanced on addition of zinc sulfate showing the maximum IE of 95% at mixtures of 200 ppm of sodium benzenesulfonates and 200 ppm of zinc sulfate. FTiR analysis confirmed on the existence of an adsorbed protective film on the mild steel surface. The calculated thermodynamic/kinetic parameter reveals that adsorption process is obey Frumkin adsorption isotherm.

Keywords: corrosion inhibition; adsorption isotherm; sodium dodecylbenzenesulfonates; zinc sulfate; mild steel; sodium chloride

C₁₈-CTA COMPOSITE FILM USAGE AS AN EXTRACTION SORBENT FOR CAFFEINE RESIDUE IN WATER ANALYSIS

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Abstract

Research work that aimed to develop the optimal condition for caffeine residue extraction in water method was successfully carried out. C₁₈ was impregnated with cellulose triacetate (CTA) by using a solution casting method to produce a thin film. Optimisation work was constructed based on a 2⁴ full factorial central composite design that was subjected to the number of C₁₈-CTA films, pH water sample, extraction time and stirring rate as the main parameters. The optimum condition suggested by the model was as follows; number of film (1-piece i.d. 66 mm), pH of water sample (9), stirring rate (200 rpm), and extraction time (30 min). The generated model and 2-way interaction were significant at p<0.05. Analytical figure of merits, i.e. linearity (r² = 0.993), recovery (92.6-94.8%), repeatability (<3% RSD), detection limit (0.13 ng/ml), and quantification limit (0.45 ng/ml) were calculated during study. Analysis of real sample showed that the developed method was able to extract caffeine residue at low level concentration. The concentrations measured from two samples were recorded at 6.98 ng/ml and 18.23 ng/ml, respectively.

Keywords: emerging contaminant; experimental design; microextraction

DETERMINATION OF AIRBORNE HEAVY METALS AND HEALTH RISK ASSESSMENT OF POPULATIONS EXPOSED TO METALS IN INDUSTRIAL AREA, GEBENG AND PAKA

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Abstract

The aim of this study is focused on airborne heavy metal pollution in the industrial area. Paka and Gebeng are chosen as the industrial area with eight points respectively were selected for this study within two monsoon seasons. The samples were analysed for heavy metals (Cd, As, Cu, Fe, Pb and Zn) by using inductively coupled plasma mass spectrometry (ICP-MS). The results showed that the mean concentration value of As, Pb and Cd for Paka were $0.005 \text{ mg/L} \pm 0.001$, $0.107 \text{ mg/L} \pm 0.088$ and $0.010 \text{ mg/L} \pm 0.008$ respectively. For Gebeng, the mean concentration value of As, Pb and Cd were $0.004 \text{ mg/L} \pm 0.002$, $0.069 \text{ mg/L} \pm 0.059$ and $0.005 \text{ mg/L} \pm 0.004$ respectively. The results showed in the southwest monsoon, the mean concentration of heavy metals much higher than the target value by European Commission in Directive 2004/107/EC and Directive 2008/50/EC. The HQs and His of six metals are almost all lower than the safe level (=1) for children and adults, indicating no risks from these metals. On the whole, HI value decreased in the order of Fe>Cd>Pb>As>Zn>Cu. Fe and Cd exhibited higher values close to safe level, while Zn and Cu are lowest. The HI values of these metals for children are higher than those for adults. It could be concluded that the industrial and transportation emission were the major source of heavy metals in the atmosphere along the Paka and Gebeng industrial area. The human health risk assessment has proved to be a powerful tool to distinguish heavy metals and exposure routes of most concern in urban environments.

IS ORGANIC VEGETABLES IN MALAYSIA REALLY ORGANIC?

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Abstract

Natural nitrogen isotope abundance ($\delta^{15}\text{N}$) has been a potential indicator to discriminate organic produce, namely vegetables, from that of the non-organic ones. However, little is known about the $\delta^{15}\text{N}$ composition of organic vegetables grown in Malaysia. Chinese spinach (*Amaranthus gangeticus*), cucumber (*Cucumis sativus*), Chinese broccoli (*Brassica oleracea* var. *alboglabra*), long bean (*Vigna unguiculata* subsp. *sesquipedalis*), okra (*Abelmoschus esculentus*), Chinese white cabbage (*Brassica rapa* subsp. *chinensis*), sweet potato leaves (*Ipomoea batatas*), string bean (*Phaseolus vulgaris*), eggplant (*Solanum melongena*) and carrot (*Daucus carota* subsp. *sativus*) are among the common vegetables grown and consumed in Malaysia, hence these organic vegetables were obtained from organic farm in Balik Pulau, Jawi, and Relau, located in Penang, Malaysia for the investigation of $\delta^{15}\text{N}$ values. Each specific farm adheres to their own set of organic farming regime which can influence the nitrogen isotopic composition in the vegetables. Results showed that organic vegetables from Balik Pulau farm, Jawi farm and Relau farm have the mean $\delta^{15}\text{N}$ value ranging from 6.62‰ to 22.38‰, 6.25‰ to 17.20‰ and 8.05‰ to 16.85‰, respectively. This shows that each set of organic farming regime has its own range of mean $\delta^{15}\text{N}$ value with Balik Pulau farm having an enriched value as high as 22.38‰. Conclusively, the mean $\delta^{15}\text{N}$ value of organic vegetables grown in Malaysia (6.62‰ to 22.38‰) is within the range of hypothesized $\delta^{15}\text{N}$ organic value ($\geq 3\%$) and were comparable to the $\delta^{15}\text{N}$ mean value worldwide (5.70‰ to 36.70‰).

Keywords: Isotopic ratio mass spectrometry; $\delta^{15}\text{N}$; Malaysia organic vegetables

RADIOLOGICAL ASSESSMENT OF SOIL FROM PAYA BUNGOR, PAHANG, MALAYSIA

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Abstract

Recently, radiological health risk and potential of ecological damage has become subject of public concern. As one of the oldest tropical rainforest in the world, the soil is expected to have radiological activities and the rate of radon gas emission to the surrounding that may pose risks to the public health. Previously, Paya Bungor, Pahang was well known as recreational water park for the public where it is surrounded by a large lake and was rich with flora and fauna. However, over the years, this area has been deserted and most of the area have been transformed into a plantation area by the locals. An increase in agricultural activities led to the use of phosphate fertilizers and pesticides that subsequently contribute to the accumulation of radionuclides and heavy metals in the soils that may give rise to the environmental impact to the surrounding. Radiological assessment of natural radionuclides and radon emanation study from soil was carried out in the study area. Soil samples were collected using a hand auger, based on a standard sampling method. Uranium, thorium and potassium mass concentration in samples were determined using Energy Dispersive X-ray Fluorescence (EDXRF) spectrometry. Then the respective activities of natural radionuclides; ^{238}U , ^{232}Th , and ^{40}K were calculated. Radon emanation rate from the soil samples were determined using Solid State Nucler Track Detector, CR-39. The results enable to determine the annual effective dose (AED) and external hazard index (H_{ex}) due to gamma-ray emission of the three natural radionuclides. While radon cancer risk could also be calculated. Generally, the results showed the concentration of ^{238}U ranging from 44.9605 ± 5.7112 Bq / kg to 89.2852 ± 10.3668 Bq / kg, ^{232}Th from 102.49 ± 8.4083 Bq / kg to 213.494 ± 87.387 Bq / kg and ^{40}K from 0.02404 Bq / kg $\pm 0.13\%$ to $0.07856 \pm 0.10\%$. The H_{ex} of the area are all less than 1, indicating low radiological risk to the population. Radon emanation rate measured range from 6.0 ± 0.5 mBq kg^{-1} hr^{-1} to 12.8 ± 0.4 mBq kg^{-1} hr^{-1} and is considered as low. However further study involving all areas around the lake (Paya Bungor) need to be carried out to make more conclusive findings on the radiological assessment of the area.

Keywords: NORM; EDXRF; Radiological Risk Assessment; Radon emanation rate; SSNTD; CR-39

DITHIOCARBAMATE-IMMOBILIZED SILICA COATED MAGNETIC Fe₃O₄ NANOPARTICLES FOR SOLID-PHASE EXTRACTION OF LEAD IN SHELLFISH

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Abstract

This study describes the synthesis, characterization and application of dithiocarbamate-immobilized silica coated magnetic nanoparticles (Fe₃O₄-CPTS-DTC) as an adsorbent for separation and preconcentration of trace lead in shellfish. The adsorbent was characterized using FTIR, SEM and XRD. The extraction efficiency of Fe₃O₄-CPTS-DTC was analysed using Flame Atomic Absorption Spectrometry. Parameters such as pH, adsorption-desorption time, effect of eluent and sample volume have been investigated in order to establish the optimum conditions for the determination of lead. The MSPE method was also validated using certified reference materials with good recovery.

NUTRIENTS DISTRIBUTION IN BESUT RIVER BASIN, TERENGGANU, MALAYSIA

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Abstract

The aim of this study was to determine the distribution of nitrogen (N)- and phosphorus (P)-based nutrients in Besut River basin, Malaysia. The mean concentrations of ammonia, nitrate, total dissolved N and total particulate N were 43 µg/L N, 195 µg/L N, 485 µg/L N, 431 µg/L N, respectively. In contrast to N, lower mean concentrations of P were recorded with values of 2.30 µg/L P (dissolved inorganic P), 4.84 µg/L P (total dissolved P) and 8.35 µg/L P (total particulate P). In general, higher concentrations of nutrients were recorded at the middle and lower reaches of the river basin due to human activities. Elevated levels of both forms of nutrients were present in wet season resulting from terrestrial runoff to the water column. The molar ratio of dissolved inorganic N:P (nitrate + ammonia: inorganic P) was extremely high (range 105-1448) than 16:1 (Redfield ratio) suggesting the nutrient limiting factor for phytoplankton growth in this river basin was P. The results from this study can be used as a baseline comparison for future monitoring of this river basin.

Keywords: Surface water; dissolved and particulate N and P; N:P ratio; Besut River basin (South China Sea)

ACCUMULATION OF HEAVY METALS CONTENT IN COMMERCIAL CRAB COLLECTED FROM JOHOR STRAIT, MALAYSIA

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Abstract

Rapid development occurs in Johor Strait lead to the pollution issue, and raises an issue on the safety to consume the sea food from the area. Hence, the objective of this study were to determine the concentration of selected metallic elements (Cu, Zn, Cd and Pb) in the blue swimmer crab from the east of Johor Strait and estimate the potential health risk on human. The samples were digested with Teflon Bomb Digestion method and the concentrations of selected metals in crab were detected by the Inductively Couple Plasma Mass Spectrometry (ICP-MS). Based on the analysis, the concentration pattern of metals in crabs decrease and order of Zn > Cu > Pb > Cd and tend to accumulate in internal organs > gill > muscle > claw muscle. All the selected elements concentration are much higher than the previous study in 1991 with the same species of crab collected from nearby area, Singapore River, this indicate that more pollutant had added into the aquatic environment and accumulate in the local seafood. Based on the trend of accumulation, the essential elements are tend to accumulate in the body of crab than non-essential element may due to the need for biological function. At the same time, the correlation result suggest that the intake of elements Zn, Cd, and Pb are size dependent but might relate to the biochemical and environmental factors. The average PLI value is 35.3, thus suggest that a long term monitoring on metallic element pollution should be conduct in the study area. According to the recommendation of PTWI, the consumption of the crab from study area should not exceed 0.42 kg per week to avoid the adverse health impact.

Keywords: Johor Straits; blue swimmer crab; heavy metals; pollution load index; PTWI

SEASONAL CHANGES OF HEAVY METALS LEVEL IN SEDIMENT OF SETIU RIVER, TERENGGANU

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Abstract

Heavy metals contaminations could have greater effects than organic or microbial contamination because these elements could be cycled over a long time through aqueous and particulate phases. This study aims to investigate the seasonal changes of distribution of selected metals elements (As, Pb, Cu and Zn) in bottom sediment of Sungai Setiu. The sediment samples were collected on January and July, 2017 in conjunction with the dry and wet season, from 60 different sampling points along Setiu river. The metals concentration was detected by using Inductively Coupled Plasma Mass Spectrometry after Teflon bomb closed digestion method with mixed acid. From the results obtained, the average concentration values of As, Pb, Cu and Zn are 3.05 ± 0.534 $\mu\text{g/g}$ dry wt ; 19.9 ± 9.89 $\mu\text{g/g}$ dry wt ; 1.304 ± 0.663 $\mu\text{g/g}$ dry wt and 68.4 ± 31.8 $\mu\text{g/g}$ dry wt for January, whereas, 2.46 ± 2.78 $\mu\text{g/g}$ dry wt ; 16.7 ± 15.1 $\mu\text{g/g}$ dry wt ; 14.7 ± 16.9 $\mu\text{g/g}$ dry wt and 68.9 ± 48.5 $\mu\text{g/g}$ dry wt for July. Result of the geoaccumulation index showed that the area still can be considered as practically uncontaminated since the I-geo values [January : As = 0.004, Pb = (-0.553), Cu = (-0.400) and Zn = (-0.331) ; July : As = (-1.256), Pb = (-1.113), Cu = (-1.239) and Zn = (-0.521)] are classified in Class 0. However, the pollution load index (PLI) revealed the higher levels of As, Pb, Cu and Zn, therefore, indicating to the anthropogenic sources especially around the fish farm area. Thus, Setiu River can be assumed as contaminated since there are heavy metal contaminations occur (PLI = 1.25 ± 0.34 (January) and 0.99 ± 1.00 (July)).

Keywords: Heavy metals; Setiu river; Sediment; As; Pb; Cu; Zn; dry and wet season

DISTRIBUTION OF HEAVY METALS CONCENTRATION IN RECENT SEDIMENTS AT MERANG RIVER, TERENGGANU, MALAYSIA

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Abstract

Human activities such as fishing, aquaculture and boating activities can be seen throughout Merang river. The main and private jetty transporting tourists to islands like Redang Island is considered as an important establishment due to high boating activities in this area. This study aimed to focus on metal study (Cr, Mn, Cu, Pb, Zn, Fe) of Merang river. A total of 64 sediment samples; 44 samples along the river and 20 samples at Merang coastal area were sampled using Ponar grab in the month of November 2017. Teflon Bomb closed digestion method with mixed acid was used to determine the concentration in the sediment. The contamination of heavy metal in the sediments were analyzed by using Inductively Coupled Plasma Mass Spectrometry (ICP-MS). The average of heavy metal concentration for the elements are as follows; Pb (29.8 ± 12.4) $\mu\text{g/g}$ dry wt, Cu (17.7 ± 6.5) $\mu\text{g/g}$ dry wt, Fe (3.5 ± 1.2) $\mu\text{g/g}$ dry wt, Zn (58 ± 22) $\mu\text{g/g}$ dry wt, Cr (37.2 ± 10.7) $\mu\text{g/g}$ dry wt and Mn (320 ± 151) $\mu\text{g/g}$ dry wt. Geo-accumulation Index (*I_{geo}*) and Pollution Level Index (PLI) approach were used to determine the heavy metals contamination levels in river sediment of Merang river. *I_{geo}* value shows that Merang river is practically uncontaminated and falls under Class 0. However, the contamination values shows higher level of all six heavy metal elements, therefore, most of the elemental sources are naturally derived. The PLI value is 1.68 ± 0.53 , hence, there are heavy metal contamination occur in Merang river. Thus, it is important to record the current levels of metals so that if there is any changes in the concentration, it can be observed and managed due to limited information of the study area is available.

Keywords: Heavy Metal; Sediment; Geo-accumulation Index; Pollution Level Index; Merang river

REMOVAL OF HERBICIDE PARAQUAT BY CETYLTRIMETHYL AMMONIUM BROMIDE MODIFIED PINEAPPLE LEAVES

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Abstract

Paraquat pesticide is categorized as contaminants of emerging concern (CEC) that can cause serious environmental problem and toxic effects toward human and animals. Whereas, the decomposing of pineapple leaves by burning in the field could create environmental problems such as air pollution. Therefore, in the present study, the pineapple leaves powder was utilized as a low-cost adsorbent to remove paraquat from aqueous solution. The adsorption of paraquat from aqueous solution by pineapple leaf powder (PLP) and surfactant modified pineapple leaf powder (SMPLP) was examined. SMPLP was prepared by reacting PLP with different concentrations of cationic surfactant, cetyltrimethyl ammonium bromide (CTAB) (0.5, 1.0, 2.5 and 4.0 mM). The PLP and SMPLP were characterized using Fourier transform infrared (FTIR) spectroscopy after the modification process with CTAB and after adsorption process with paraquat. The result shows that there are no significant changes in the chemical structure of pineapple leaves after modification. The SMPLP exhibited higher adsorption affinity toward cationic herbicide. The adsorption experiments of paraquat were carried out in a batch mode at room temperature. The effect of paraquat concentration (2-20 mg/mL) on the adsorption capacity of PLP and SMPLP were investigated. The suitability of adsorbent was tested by fitting the adsorption data into Langmuir and Freundlich isotherm equilibrium models. The experimental adsorption data fitted well with Freundlich isotherm with multilayer adsorption capacity of 13.0 mg/g. The highest removal of paraquat was obtained by SMPLP treated with CTAB 2.5 mM while the lowest removal was found for PLP. As a conclusion, the utilization surfactant modified pineapple leaves powder can become an alternative adsorbent for the removal of herbicide compound in aqueous solution.

Keywords: Paraquat; pineapple leaves; surfactant; adsorption

THE DETERMINATION OF SELECTED ELEMENTS FOUND IN SAMPLES COLLECTED FROM RIVERS IN GEBENG AREA

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Abstract

A study was carried out to determine the level of concentration of selected elements in samples collected from two rivers located in Gebeng area, Kuantan, Pahang. The rivers selected were namely as Balok River and Tunggak River. The samples collected were analyzed by using Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). Prior to Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) analysis, the samples were going through a few steps of sample preparations. From the result of this study, it was found that the preferences of various elements traced in the samples collected were different in average of concentration and range from the upstream area, middle stream area and downstream area of both of the selected rivers.

Keywords: Rivers; trace elements; Inductively Couple Plasma-Mass Spectrometry

ABUNDANCE OF PROTOZOA AND HAEMOPARASITES IN ANURANS FROM HIGHLAND AND LOWLAND GOLF COURSES

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Abstract

Frogs are important in maintaining stable ecosystems and they eat insects which are the important vectors in transmitting diseases in human. Unfortunately, they have been shrinking in numbers worldwide. Factors contributing to this include fragmentation, pollution, UV radiation, pesticides, climate change and parasites. This study was conducted to determine the water quality index, usage of pesticide and assemblage of anurans. The abundance of anuran protozoan and the haemoparasites present in the host from three different location sites which are Jeriau River, Fraser's Hill Golf and UKM Danau Golf was also determined. Water quality index was determined by six physico chemical parameters including biochemical oxygen demand, chemical oxygen demand, total suspended solid, ammonia-nitrogen, dissolved oxygen saturation and pH. Anurans were collected during at night and killed using the pithing method. Protozoan were observed in liver, stomach, intestine, rectum and kidney. Thin blood smears were prepared from the blood samples and observed for haemoparasites. Results from this study concluded that there are no significant evidences to prove that environmental parameters such as water quality index and usage of pesticide (metsulfuron methyl) affected the composition of anurans and also the presence of protozoan and blood parasites. UKM Danau Golf (disturbed area) had the lowest WQI at class III but it had the most diverse anurans while Jeriau River (non-urban) with the highest WQI at class I had the most abundant anurans though limited in the number of species. 30% of frog were found to be infected with one or more protozoa. 22.14% from Phylum Opalinata and 10.71% from Phylum Ciliophora. These protozoan were only detected in intestines and rectums. 44.44% of anurans were infected with one or more group of blood parasites including *Trypanosoma*, *Haemogregarina*, *Lankesterella*, *Aegyptianella* and *Microfilaria*. *Trypanosoma* had the highest prevalence followed by *Haemogregarina*, *Aegyptianella*, *Lankesterella* and *Microfilaria*.

Keywords: anuranh; haemoparasites; protozoa; pesticide; metsulfuron methyl; golfcourse

DETERMINATION OF GLYPHOSATE AND AMINOMETHYLPHOSPHONIC ACID AND GLYPHOSATE POTENTIAL TO GROUNDWATER POLLUTION

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Abstract

Glyphosate (GLY) is an herbicide widely use in agriculture and having a wide spectrum and non-selective mode of action. The use of glyphosate in Malaysian agriculture produces an interest in learning about the presence of these substances in different environmental matrices. With the aim of evaluation on the contamination produced by GLY and its metabolite, aminomethylphosphonic acid (AMPA) in water, sediments and soils, it is important to establish a set of standard determination techniques. In this research work, the earlier published analytical method for determination of GLY and AMPA has been improved in order to be applied for water and sediment/soils. The sediments/soil samples were extracted using potassium hydroxide, conversely for water samples, the samples were directly use. The method further consist of derivatization with 9-fluorenylmethylchloroformate (FMOC-Cl) followed by determination with high performance liquid chromatography (HPLC) coupled with fluorescence detector. A good linear relationship (correlation coefficients ≥ 0.99) for GLY and AMPA standards were observed within the range of 0.001–0.1 mg/L. The limit of detection (LOD) and the limit of quantitation (LOQ) were determined in water to be 0.01mg/L and 0.05mg/L, respectively. But for soils/sediments, LOD and LOQ were to be 0.05mg/kg and 0.1 mg/kg, respectively. The precision and accuracy for both GLY and AMPA were satisfactory with the relative standard deviation (RSD) lower than 10% and the mean recovery values ranging from 75% to 105% (n = 3), that spiked at three levels (0.5, 1.0 and 2.0 mg/kg) in sediments/soils. The groundwater ubiquity score (GUS) is an experimentally calculated value that relates pesticide half-life and sorption potential Koc (from laboratory data). The GUS may be used to rank pesticides for their potential to move toward groundwater. For this research, value of GUS index for three rain simulations (light, intermediate and heavy) were 6.56, 7.59 and 6.73 respectively. Based on the results, all level of rain simulations were having high potential to cause groundwater pollution.

Keywords: herbicide; metabolite; HPLC; florescent detector; groundwater ubiquity score

STATISTICAL ANALYSIS AND MOLECULAR DOCKING STUDY ON HALAL POTENTIAL ANTIOXIDANT FROM *Anacardium Occidentale* FRUITS

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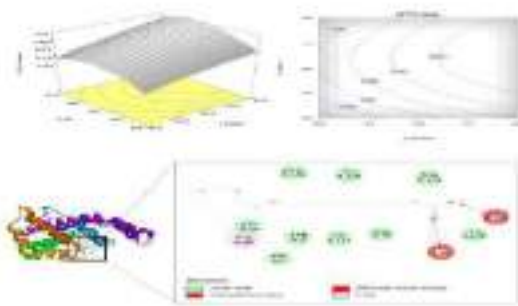
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Abstract

Lipids in foods are prone to oxidation that causes deterioration of food quality and formation of free radicals. Free radicals in food products can cause oxidative damage which could result in many chronic health diseases. Commercially-available synthetic antioxidants used as food additives are reported to endanger health. Therefore, Halal natural antioxidants from plants are investigated. In this study, viscous liquid containing antioxidant properties was extracted from freeze-dried cashew (*Anacardium occidentale*) apple using supercritical fluid extraction (SFE) with carbon dioxide (CO₂) as the solvent. The extractions were optimized with response surface methodology (RSM) using the central composite rotatable design (CCRD). The effects of pressure (x_1 ; 200-300 bars), time (x_3 ; 30-90 min), and temperature (x_2 ; 30-50°C) were studied on the antioxidant activity of the liquid, measured using the DPPH inhibition assay. The statistical analysis was performed by ANOVA and the quadratic model obtained is significant ($R^2 = 0.9858$). Based on the RSM model, the optimal extraction conditions were obtained at 288.98 bar, 66.21 min, and 36.98°C that yields 70.3399% DPPH inhibition, which is in reasonable agreement with the validation test ($n = 3$) that yields the highest activity ($71.5167 \pm 0.6684\%$). Based on the t -values, the ascending order of the effects of linear terms on cashew apple antioxidant activity was temperature < time < pressure. The total phenolic content of the extract is 0.056 mg GAE/mL. The optimised extract was analysed using GC-MS and FT-IR for chemical compounds identification. Four prominent compounds were identified from the chromatogram. The antibacterial activity of the extract was tested against Gram-positive and Gram-negative bacteria. Molecular docking was used to study the interactions of the identified compounds from the extract with the bacteria.



Keywords: *Anacardium occidentale*, response surface methodology, supercritical fluid extraction, antioxidant, antibacterial, molecular docking

ANTIOXIDANT ACTIVITY AND *IN VITRO* CYTOTOXICITY STUDY OF THE PHENOLIC COMPOUNDS FROM *Piper Sarmentosum*

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Abstract

Cancer is by far one of the most worrying health issues and continues to be the major killing diseases, worldwide accounting for more than 6 million died because of the cancer and it is predicted that cancer incidence is continue rising every year with an approximated 12 million of deaths in 2030. The significant interest has been concentrated increasingly in finding medicinal herbs and their derivative phytochemicals as useful supportive treatments for cancer. Besides that, about 60% of currently used anticancer agents are derived from natural sources, including plants due to its less side effects. *Piper sarmentosum* Roxb. is locally known as 'kaduk' is one of natural medicinal herbal and is being used traditionally to treat headache, arthritis, menstrual pain, cough and eczema. It is proven to have various biological properties including hypoglycaemic effect, anti-inflammatory, antioxidant, antimalarial, antiplasmodial, anti-diabetic, antifungal and anticarcinogenic. The aims of this study are to identify the phenolic compounds of *Piper sarmentosum* methanolic extracts by measuring total phenolic content, HPLC analysis, to evaluate the antioxidant activity by DPPH scavenging assay and also to determine the cytotoxicity effect on human breast cancer cells. *Piper sarmentosum* exhibited antioxidant property at 96.98 ± 2.29 $\mu\text{g/mL}$ by DPPH scavenging activity with its high phenolic content at 89.22 mg GAE/ g dry extract. The HPLC analysis showed the presence of quercetin, naringin, gallic acid and tannic acid in *Piper sarmentosum*. The cytotoxicity screening of *Piper sarmentosum* extract using MTS assay indicated IC_{50} of 24.63 ± 0.23 $\mu\text{g/mL}$ and 2.85 ± 0.16 $\mu\text{g/mL}$ on MCF-7 and T-47D, respectively. The phenolic compounds of *Piper sarmentosum* possess potent antioxidant and anticancer properties against breast cancer cells. However, further study should be conducted to establish its anticancer mechanisms.

Keywords: *Piper sarmentosum*, medicinal plants, phenolic compounds, antioxidant, cytotoxicity.

LC-MS CHARACTERIZATION OF PHENOLIC COMPOUNDS AND ANTI-ACANTHAMOEBIC PROPERTIES OF *Piper Sarmentosum* (KADUK) LEAVES METHANOLIC EXTRACT

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Abstract

Phenolic compounds are plant secondary metabolites that are beneficial to human health. Previous studies reported that many plant extracts could mitigate the effect of many microbial infections attributed to its phenolic content. *Piper sarmentosum* or locally known as Kaduk is a tropical herb that has long history in traditional medicinal purposes and food and the plant was reported to contain many bioactive compounds including phenolic compounds. In this study, the phenolic compounds in crude methanolic extract of *Piper sarmentosum* leaves were characterized and its anti-amoebic properties were evaluated against two pathogenic *Acanthamoeba* namely *Acanthamoeba castelanii* and *Acanthamoeba* sp. (Hospital Kuala Lumpur (HKL) isolate). The phenolic compounds were first characterized using high resolution liquid chromatography-mass spectrometry (LC-MS) analysis, followed by two cytotoxicity assays: determination of IC₅₀ by eosin dye method and cell morphological analysis using inverted light and scanning electron microscopies. A total of 39 phenolic compounds were identified, predominantly comprised of 15 phenolic glycosides. The IC₅₀ values obtained were 74.64 µg/mL for *Acanthamoeba castelanii* while 22.13 µg/mL for *Acanthamoeba* sp (HKL isolate). Microscopy analyses showed that the extract caused cell encystment indicated by distinctive morphological changes on acanthopodia, cell shape and cell organelles. The result provided the evidence that crude methanolic extract of *Piper sarmentosum* leaves contains active phenolic compounds that contributed to its anti-acanthamoebic properties.

Keywords: *Piper sarmentosum*, LC-MS, Phenolic, Anti-amoeba, *Acanthamoeba*, Cytotoxicity

PRODUCTION OF BACTERIAL-BASED VIOLACEIN NANOPARTICLES AND EVALUATION OF THEIR STABILITY USING SURFACTANT AS STABILIZER

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Abstract

Violacein, a violet biopigment produced from *Chromobacterium violaceum* has gained interest due to its antimicrobial, anticancer and antioxidant activities. However, limited solubility of violacein in water has restricted its applications in various industries. Hence, this study focuses on the production of violacein nanoparticles using sonication technique. Owing to the exceptional properties of high surface to volume ratio of nanoparticles, the solubility of the violacein pigment in water could be improved. It is well known that particles in nanoscale will tend to aggregate, thus causing diminution of their biological activities. In order to overcome this problem, the addition of surfactants to ensure steric and electrostatic stabilization is chosen as a technique to stabilize the nanoparticles. As results, water soluble violacein nanoparticles were successfully produced at surfactant concentration above the critical micelle concentration. Minimum particles size of 131.5 ± 2.001 nm with polydispersity index of 0.180 ± 0.018 and zeta potential of -49.8 ± 3.49 mV were obtained indicate that the particles were monodispersed and stable upon dispersion in water. In addition, the violet color of the nanoparticles was maintained despite its nanoscale size. In conclusion, the method used in this study provides potential solutions in developing and stabilizing natural colorant pigment dispersions down to the scale of nanometer, consequently, will widen up their application in various industries with the aid of non-toxic and eco-friendly properties.

Keywords: Violacein nanoparticles; surfactants; water solubility; sonication technique

DISCOVERY AND DEVELOPMENT OF HALAL PROTEASE FROM *Spondias Cytherea* FOR MEAT TENDERIZATION

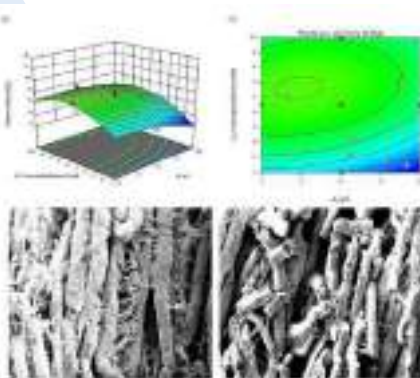
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Abstract

Meat tenderness has been recognized as the most important quality trait for consumer satisfaction. In this regard, meat industry especially in Malaysia strive to search a new method development for producing meat with standardized and guaranteed tenderness. Protease treatment is one of the popular methods used by meat industry due to its efficiency, safety, and halal status. Therefore, this research sought to identify a novel protease from Ambarella fruits (*Spondias cytherea*) as a new potential halal meat tenderizer. The protease extraction was done following the treatment combinations by RSM that investigated the possible interactions between four variables which are pH (pH 6 – 10), TX-100 (1 – 5 %), 2-mercaptoethanol (1 – 10 mM), and mixing time (1 – 3 min) on protease activity. The most optimized extraction variables was found at pH 8.22, 4.95 % of TX-100, 6.80 mM of 2-mercaptoethanol, and 1.71 min of mixing time at 12.37 U/g of protease activity. The overall model was significant ($p < 0.05$) with satisfactory R^2 value at 0.9885. Characterization of the crude Ambarella protease showed that the enzyme is stable at pH 8.0 – 10.0 and temperature up to 60 °C. Incubation of enzyme with organic solvents showed higher activity in hydrophobic rather than hydrophilic phases. In addition, prolonged storage time (14 days) of Ambarella protease resulted in decreased activity by 32 %. For application in meat tenderization, chunks of beef samples were marinated with Ambarella crude enzyme before subjected to various physical and chemical properties determinations. The SDS-PAGE pattern of the muscle proteins revealed extensive proteolysis and reduction of protein bands in the treated samples. Through texture analysis, firmness of the muscle samples was significantly decreased with the increased addition of crude Ambarella protease (mL). In addition, at the microstructural level, tissue fibers were broken and loosen of myofibrils upon treatment with Ambarella protease was observed. From the results, it is determined that protease from Ambarella fruit can be used as an alternative source of proteolytic enzymes in meat tenderization.



Keywords: Protease, Response surface methodology (RSM), Meat tenderization, *Spondias cytherea*, Electrophoresis, Scanning Electron Microscopy (SEM), Texture

SEPARATION OF UNSATURATED FATTY ACIDS FROM PALM STEARIN USING METHANOL-CRYSTALLISATION METHOD

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Abstract

Refined, bleached and deodorized palm stearin (RBDPS) was hydrolysed using ethanolic potassium hydroxide (KOH) based on two different parameters such as concentration of ethanolic KOH used (1.50 M, 1.75 M and 2.00 M) and temperature (70 °C, 75 °C and 80 °C) upon heating for 2 hours. A methanol-crystallisation method was introduced to optimise the separation and purification of unsaturated fatty acids (UFA) of RBDPS from its saturated fatty acids (SFA) by manipulating the weight ratio of FFA : MeOH (1:5, 1:6, 1:7, 1:8, 1:9 and 1:10) and temperature (-5 °C and -20 °C) for 24 hours. Free fatty acids (FFA) were characterised using fourier transform infrared spectroscopy (FTIR), gas chromatography (GC-FID) and nuclear magnetic resonance (¹H and ¹³C NMR). The highest yield (98 % by weight) was obtained using FFA:methanol with 1:9 by weight ratio. The iodine value (IV) recorded for SFA and UFA are 0 and 98 respectively. High purity of unsaturated fatty acids can be utilized in various applications such as food formulation, biolubricant synthesis, polymers and pharmaceuticals.

Keywords: palm stearin; hydrolysis; unsaturated fatty acids; methanol-crystallisation method; separation; purification

COMPARISON OF THE ESSENTIAL OIL COMPONENTS IN FRESH PEELS OF LIME (*CITRUS AURANTIFOLIA*) EXTRACTED WITH SUPERCRITICAL FLUID EXTRACTION AND OTHER THREE TRADITIONAL EXTRACTION METHODS

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Abstract

Citrus is one of the famous crops that widely cultivated and is the most commonly utilized fruits in the world due to its pleasant taste and nutritional value. Citrus essential oil is also highly in demand by consumer but the production cost is quite expensive as it produced in very low quantity. Moreover, the chemical compositions in citrus essential oil influence its biological activity such as antioxidant, germicidal, antifungi and antimicrobial. Unfortunately, there is lack of information comparing the chemical components in *Citrus aurantifolia* essential oils extracted using different methods. In this study the peels of *C. aurantifolia* fruits were extracted using hydro-distillation, steam-distillation, solvent extraction and supercritical fluid extraction (SFE) techniques and the chemical composition was compared using Gas Chromatography-Mass Spectrometry (GC-MS) and Gas Chromatography-Flame Ionization Detector (GC-FID). The main components in the essential oils from hydro-distillation and steam-distillation were (+)-limonene, (-)- β -pinene and α -citral with leden oxide (II) and 5 α -cholestan-3 β -ol, 2-methylene were also present in the essential oil from steam-distillation process. While, ethyl iso-allocholate, citraptene, D:C-friedours-7-ene-3-one, herniarin, and isopimpinellin were the major components present in the essential oil from solvent extraction method. In SFE extraction, the main chemical compounds in peel of *C. aurantifolia* were 7,9-di-tert-butyl-1-oxaspiro(4,5)deca-6,9-diene-2,8-dione, citraptene, isopimpinellin, and herniarin. The results show that monoterpene was the major component in hydro-distillation and steam-distillation while, coumarin was the major component in solvent extraction and SFE methods. The results also indicate that different extraction methods used produce different yield and chemical constituents. The percentage yield and major class of component of fresh peels *C. aurantifolia* using different methods were significantly different ($p < 0.05$). However, there was no significance difference ($p > 0.05$) in extraction methods used in total chemical composition in *C. aurantifolia* essential oils.

Keywords: *Citrus aurantifolia*; extraction; essential oil; chemical components

QUATIFICATION OF CARRAGEENAN IN *GRACILARIA CF. MANILENSIS* (RHODOPHYTA) EXPOSED TO DIFFERENT SALINITIES AND pH USING ATTENUATED TOTAL REFLECTION-FOURIER TRANSFORM INFRARED SPECTROSCOPY (ATR-FTIR)

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Abstract

Carrageenan is a gel-forming and viscosifying polysaccharides that is commonly found in red algae (Rhodophyta). Previous studies indicate that carrageenan content in the seaweed can be influenced by different environmental conditions. Therefore, in this study, *Gracilaria cf. manilensis*, a red algae, was exposed at 500 lux under different salinities (15, 20, 25 and 30 psu) and pH (7.6, 7.8 and 8.0) in laboratory condition and carrageenan was determined qualitatively and quantitatively using Attenuated Total Reflection-Fourier Transform Infrared Spectroscopy (ATR-FTIR). Qualitatively, kappa carrageenan was found in most of the *Gracilaria* samples. Quantitatively, kappa carrageenan was detected ranging from 29.74 ± 7.24 to 56.97 ± 4.03 % (w/w) with the highest carrageenan content was determined at low salinity and slightly neutral pH (15 psu and pH 7.6). However, *G. cf. manilaensis* collected from farm and used as a control did not showed the presence of carrageenan. This suggests that different environmental conditions play an important role in determining the carrageenan type and content. This is important as carrageenan is widely used in food, medicinal, pharmaceutical and industrial applications. Furthermore, *G. cf. manilensis* can be an alternative source of carrageenan besides available sources which is quite limited, to fulfil the high demand of carrageenan.

Keywords: red algae; light intensity, salinities; pH; kappa carrageenan

APPLICATION OF DIRECT FLUORESCENCE-BASED LIVE/ DEAD STAINING FOR ASSESSMENT OF ANTIFUNGAL ACTIVITY OF COCONUT OIL AGAINST *Candida albicans*

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Abstract

Candida albicans is becoming a significant problem for oral candidiasis worldwide. In addition, the proliferation of antifungal-resistant *C. albicans* has become a major concern. This study was carried out to evaluate the effects of activated virgin coconut oil (AVCO) and the crude extract of virgin coconut oil (VCO) to search for a new antifungal agent for treatment of oral candidiasis. The viability of *C. albicans* cells was determined using live/dead bacterial viability kit. *C. albicans* cells were grown in YPD broth culture overnight. The fungus was treated with AVCO and VCO at the concentration of minimum inhibitory concentration (MIC), 6.24 µg/ml. To evaluate the viability of *C. albicans* cells, SYTO 9 and propidium iodide (PI) staining were used in this study and observed using fluorescence microscopy. *C. albicans* cells treated with AVCO showed more dead cells compared to cells treated with VCO. The data indicated that exposure of *C. albicans* to AVCO was the most inhibitory to growth ($P < 0.01$).

Keywords: Live-dead staining; antifungal activity; *Candida albicans*; coconut oil

THE AUTHENTICATION AND EVALUATION OF QUALITY OF CRUDE PALM OIL USING FOURIER TRANSFORM-INFRARED SPECTROSCOPY (FT-IR) AND FOURIER TRANSFORM-NEAR INFRARED SPECTROSCOPY (FT-NIR) COMBINED WITH CHEMOMETRIC ANALYSIS

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Abstract

This study was carried out to discriminate fresh palm oils from that of used ones by assessing the authenticity and quality characteristics using mid-infrared and near-infrared spectroscopy. Fresh crude palm oil (CPO) samples were fried with different portion of meat products, at varying frequency of 3, 10, 20 and 30 times. Then different proportion of used frying oil, 5, 10, 20, 30 ($m/m\%$) was blended into CPO. Chemometric was applied on the infrared spectra and discrimination was carried out using discriminant analysis (DA). Results showed that the analysis with mid-IR spectra successfully distinguished the adulterated oil samples from that of authentic CPOs with 2 misclassification, in which case, 2 adulterated samples out of 66 samples were grouped into the authentic group. The performance index of this model was 95.1 based on the Mahalanobis distance. The success rate of authentication was 96.7%. On the other hand, the NIR data gave different result as 11 adulterated samples out of 66 samples showed false positive. The performance index of this model was 85.7. The success rate of authentication was 83.3%. For the work on discrimination based on oil quality using mid-IR, the success rate was low with only 42.4% with the performance index of 73.4. Similarly, the NIR model for oil quality discrimination had 36.4 % of success rate with the performance index of 56.4. The discrimination based on oil quality was not very successful and further work will be carried out in the future. Overall, the authentication of palm oil was quite successful but the discrimination based on quality did not achieve the current objective. These rapid screening techniques, which are mid-infrared and near-infrared spectroscopy has proven to be useful for the authentication of edible palm oil but discrimination based on quality has to be further improved.

Keywords: Crude Palm Oil; authenticity; mid-infrared; near-infrared; discriminant analysis

ROLE OF L-GLUTAMINE IN THE *IN-VITRO* GROWTH OF HCT-8 AND HT-29 CELL LINES

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Abstract

L-glutamine is one of the essential supplements of *in-vitro* growth medium for cancer cells. The amino acid L-glutamine is well known as the vital source of nutrition in cancer cell growth for its ability to provide carbon and nitrogen. A common phenomenon of cancer cell is the rapid production of lactic acid through aerobic glycolysis. Apart from nutritional value, the released ammonia from L-glutamine may neutralize the acidic environment to ensure continuous cell growth. The study aimed to observe the role and effect of L-glutamine concentration in culture media for cancer cell lines. Detection of L-glutamine uptake and ammonia release by the cell line was carried out after certain time intervals. Complete cell growth media was prepared where L-glutamine concentrations were 0 mM, 10 mM and 15 mM with different pH range (pH 6.5 and pH 7.0). The cell density was calculated after 8 hrs of time interval using Trypan Blue staining method. UV-VIS spectrophotometer was used to detect the concentration of L-glutamine uptake and ammonia release. The result shows that the cell density decreases continuously in the media without L-glutamine supplement whereas, a rapid increase is observed in L-glutamine supplemented growth media in HCT-8 and HT-29 cell lines. The L-glutamine uptake was found higher in the media with low pH, but a relatively low L-glutamine consumption was observed in media with higher pH condition. The result confirms the necessity of L-glutamine in cancer cell growth. In addition higher L-glutamine uptake in acidic condition supports the role of L-glutamine in acid resistance activity in cancer cell growth.

Keywords: L-glutamine; cancer cell growth; aerobic glycolysis; acid resistance

DESIGN AND DEVELOPMENT OF HALAL NANOCOSMECEUTICAL CONTAINING HYDROLYSATE FROM *ACTINOPYGA LECANORA*

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Abstract

Actinopyga lecanora (*A. lecanora*), commonly known as stone fish is classified among edible species of sea cucumber. The stone fish is reported to be rich in antioxidant, antibacterial and wound healing properties that are essential in skin care products mainly to demote skin aging. Women in the age of 40 and above tend to age predominantly as the thickness of the skin and collagen decreased naturally. Moreover, hectic lifestyle with constant exposure to UV radiation also contributed to the premature skin ageing such as darkening and pigmentation. There are many anti-aging products available in the market, however the effectiveness of the product varies depending on the skin penetration of the actives. These problems have lead to the current research on the developments of nanoemulsion as a novel skin care product to maintain healthy skin, while upholding the youthful appearance. Nanoemulsion is a dispersion of nanoscale droplets (20-200 nm) formed using mechanical device. The system involves two immiscible phases, which are oil and water phases stabilized by a surfactant. Nanoemulsion is promoted for the delivery of active ingredients to the targeted cells for better penetration. In recent years, skin care products from hydrolysate or biopeptide become more popular due to their beneficial ability to stimulate the physiological processes. To date, the application of *A. lecanora* hydrolysate is only utilized as a component in functional food. However, no work has been conducted on its potential for cosmeceutical application. In this study, the *A. lecanora* hydrolysate was extracted and used as a bioactive compound in the formulation. The extraction optimization of *A. lecanora* hydrolysate was done using two-level factorial design analysis with four parameters identified to be responsible in the enzymatic hydrolysis reaction (pH, reaction temperature, reaction time and enzyme/substrate ratio). Degree of hydrolysis (DH), 2,2-Diphenyl-1-picrylhydrazyl (DPPH) assay and ferric reducing antioxidant power (FRAP) assay were the responses. Analysis of variance (ANOVA), main effects, normal plot of residuals, 3D contour plots were used to study the effects and interaction between parameters. The best conditions selected from the optimization were; pH 5, 70°C reaction temperature, 9 h hydrolysis time and with 1 % enzyme/substrate ratio gave 51.9 % DH, 42.7 % DPPH activity and 109.9 Fe²⁺µg/ml in FRAP assay. A stable nanoemulsion formulation containing hydrolysate from *A. lecanora* was prepared by high-energy emulsification method. The formulation was designed and optimized using D-optimal mixture design with five independent variables (oil, surfactant, hydrolysate, xanthan gum and water). The physicochemical and stability of the optimized nanoemulsion were also determined. The optimal nanoemulsion have a potential for topical application in cosmeceutical industry.

Keywords: hydrolysate; stone fish; antioxidant; skin care; nanoemulsion; *Actinopyga lecanora*

CHEMICAL COMPONENTS OF PCR IN 18S rRNA FOR *CRYPTOSPORIDIUM* DETECTION FROM RIVERS

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Abstract

The gene of 18S ribosomal RNA or 18S rRNA is the universal gene function as a general genetic marker for species identification of microorganisms including parasites. *Cryptosporidium* has also distinct 18S rRNA genes along different species within the same genus. In this study, polymerase chain reaction or PCR was used to study chemical components of PCR setup in amplification of 18S rRNA gene of this parasite. *Cryptosporidium* was collected from river water samples and confirmed its presence using specific immunofluorescence detection of this parasite. Isolated water containing *Cryptosporidium* was then subjected for genomic DNA extraction before PCR step. The chemical components of PCR consists of MgCl₂, deoxynucleotide triphosphate (DNTPs), Polymerases, free DNase-water, universal primers and PCR buffer were studied in different volume and concentration. Each chemical component of PCR was optimized differently in yielding the same final volume of 20 uL per each reaction. The value range of chemical components of PCR consists of MgCl₂ (0.1 uM-0.5 uM), DNTPs (50-250 mM), free DNase water (5-10 uL), polymerases (0.2-0.5 U) and universal primers (2-20uM). The result indicated that 0.2 uM of MgCl₂, 100 mM of DNTPs, less than 10 uL of free DNase water, 0.5 U of polymerases and 10 mM of universal primers were the best combination to get better result for molecular identification of 18S rRNA *Cryptosporidium*. As a conclusion, accurate and proper concentration or volume to each PCR chemical components is essential for molecular identification of 18S rRNA *Cryptosporidium* gene. In future studies, study on gradient of temperature parameters of PCR run can be included to study the chemical nature of amplified genes either in denaturation, annealing or extension steps.

Keywords: chemical; *Cryptosporidium*; MgCl₂; PCR, polymerases; 18S rRNA gene

DESIGN AND DEVELOPMENT OF NANO-SIZED NIOSOMES CONTAINING COLLAGEN HYDROLYSATE FROM LOCAL JELLYFISH (*Rhopilema hispidum*) WITH POTENTIAL ANTIOXIDANT AND TYROSINASE-INHIBITING ACTIVITIES

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Abstract

Collagen is the main building block in mammals and known to play crucial role for skin rejuvenation and reducing wrinkles. However, common sources of collagen are bovine and porcine, which has been controversial due to the outbreak of disease namely bovine spongiform encephalopathy (BSE) that can be transmitted to human and religious issues. Therefore, collagen derived from marine organism like edible, local jellyfish (*Rhopilema hispidum*) is preferred to solve these issues. Collagen extracted from jellyfish was further hydrolysed using papain at its optimum condition in order to obtain desired activities. Collagen hydrolysates obtained from this study has been shown to exhibit antioxidant (80 % metal chelating activity and 25 % DPPH scavenging activity) and tyrosinase inhibiting activity (up to 62 %). The hydrolysates were further encapsulated into niosomal formulation using thin film hydration techniques and sonication method, and further optimized using mixture experimental design (MED). Niosomes is a novel vesicular carrier system having droplet size between 10 to 100 nm, providing large surface area for rapid penetration of active ingredients into the skin. It offers numerous advantages including powerful permeation ability with high actives loading capacity and also non-irritant to skin. At the end of the research, it is expected that niosomal formulation containing collagen hydrolysates which suitable for skin care will be developed with excellent stability and effectivity.

CYTOTOXIC EFFECT OF THE CHEMICAL CONSTITUENTS FROM THE RHIZOMES OF *BOESENBERGIA ROTUNDA*

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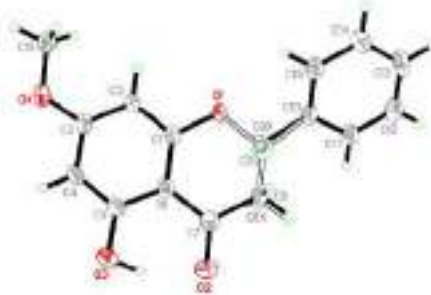
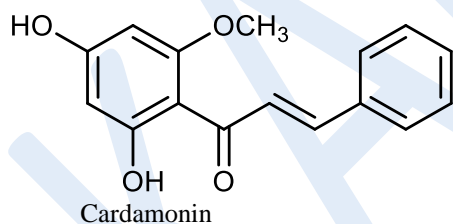
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Abstract

The *Boesenbergia rotunda* is commonly known as “Temu Kunci” or finger root. It is herbaceous ginger species belong to family *Zingiberaceae* and originated from Southeast Asia. China. Breast cancer is the most common cancer and the second most common cause of death in women in the United States. Breast cancer begins in the breast tissue that is made up of glands for milk production, called lobules. Colon cancer is one of the main causes of cancer deaths in the Western world. This is mainly because of progressively increasing, changes in lifestyle, particularly changes in dietary habits. According to the National Cancer Institute 232,340 female breast cancers and 2,240 male breast cancers are reported in the USA. Their characterizations were achieved with help of single X-ray, ¹H-NMR, HREIMS, EI-MS and ¹³C-NMR spectroscopic techniques. The isolated compounds were screening against colon cancer (H-29) and MDAMB23. A brief about biological and characterizations studies of the title will be present.



Keywords: *Boesenbergia rotunda*, cardomonin, breast cancer lines and colon cancer cell lines

FENOPROFEN INTERCALATED INTO LAYERED DOUBLE HYDROXIDE FOR CONTROLLED RELEASE DRUG DELIVERY STUDY

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Abstract

Fenopropfen, a non-steroidal anti-inflammatory Drug (NSAID) was successfully intercalated into Zn-Al-layered double hydroxide (ZAL) by direct co-precipitation method at optimum condition of 0.3 M fenopropfen and molar ratio of Zn:Al = 2. This successfully intercalation confirmed by patterns analysis from Powder X-Ray Diffraction (PXRD), Fourier Transform-Infrared Spectroscopy (FT-IR), Elemental Analysis (CHNS), Brunauer-Emmett-Teller (BET) surface area analysis and Ultraviolet-Visible (UV-VIS) Spectroscopy. Basal spacing of ZAL synthesized in this study observed from PXRD is 9.8 Å. Due to the inclusion of fenopropfen into the layered materials, basal spacing expanded to 20.1 Å in Zn-Al-fenopropfen (ZAF). Both FTIR spectra of the hybrid nanocomposite show resemblance peaks of the layered double hydroxide (LDH) and fenopropfen indicating the inclusion of the drug into the LDH interlamellae. The percentage loading of fenopropfen calculated from the data obtained from CHNS analyzer is 63.40 % (w/w) in ZAL. This study shows that ZAL can be a potential carriers for sustained release delivery of fenopropfen.

Keywords: Layered double hydroxide, fenopropfen, controlled release, anti-inflammatory, drug, drug delivery

SYNTHESIS AND CHARACTERIZATION OF NANOHYBRID ANTI-HYPERTENSIVE DRUG, CAPTOPRIL INTERCALATED INTO ZINC-ALUMINIUM LAYERED DOUBLE HYDROXIDE

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Abstract

Captopril (CPL), an anti-hypertensive drug was intercalated into the interlayer spaces of zinc-aluminium-layered double hydroxide (LDH) for the formation of the ZCPL hybrid nanocomposite material by self-assembly method. The concentration of CPL used was 0.08 M and pH 7 in a constant 4:1 molar ratio of Zn : Al in the mother liquor. As a result of the successful intercalation of captopril (CPL), powder X-ray diffraction pattern (PXRD) shows the basal spacing increased from 8.91 Å in zinc-aluminium layered double hydroxide (ZLDH) to 9.69 Å in the ZCPL nanohybrid material. FTIR study shows the intercalated compound of ZCPL resembled the spectra of ZLDH and captopril (CPL) thus indicating the presence of both functional groups in ZCPL spectra. CHNS analysis shows the ZCPL nanohybrid material contains 30.63 % (w/w) of CPL calculated based on the percentage of carbon in the sample. It was also found that the BET surface area increased from 1.7 m² /g to 10.9 m² /g for ZLDH and ZCPL, respectively. The pore texture of the resulting material was also changed as the result of the intercalation and the expansion of the basal spacing together with pore formation between the crystallite during the formation of the resulting layered intercalated ZACPL nanohybrid material.

Keywords: captopril, anti-hypertensive drug, intercalation, layered double hydroxide, nanocomposite

PREPARATION AND CHARACTERIZATION OF S-QUINOLIN-2-YL-METHYLDITHIOCARBAZATE FUNCTIONALIZED MAGNETIC NANOPARTICLES

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Abstract

The Fe₃O₄ magnetic nanoparticles (MNPs) attached with *S*-quinolin-2-yl-methyl-dithiocarbazate (SQ2MDTC) have been developed, aiming to function as the heavy metal adsorbent. The surface of MNPs was first coated with (3-aminopropyl)triethoxysilane (APTES) as cross-linker and then SQ2MDTC was covalently incorporated to the coated MNPs. The structural and surface characteristics were investigated by Fourier transform infrared spectroscopy (FT-IR), CHNS elemental analysis, thermogravimetric analysis (TGA), x-ray powder diffraction (XRD), field emission scanning electron microscopy (FESEM), and Brunauer-Emmett-Teller (BET) analysis. The SQ2MDTC functionalized MNPs exhibited high adsorption affinity for aqueous Cu(II) and Pb(II) ions when analysed using inductively coupled plasma optical emission spectrometer (ICP-OES), resulting from complexation of the metal ions by surface amino groups. Findings of the present work highlighted the potential of MNP-SQ2MDTC as an effective adsorbent for the removal of heavy metal ions in water and wastewater treatment.

Keywords: magnetic nanoparticles, *S*-quinolin-2-yl-methyl-dithiocarbazate, heavy metals removal

POTENTIAL OF NITROCHITOSAN SOLID BIOPOLYMER ELECTROLYTE

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Abstract

Utilization of chitosan derivatives has enhanced electrochemical properties of chitosan as host polymer. In this work, the potential of nitrochitosan for biopolymer electrolyte will be explored. The substitution of nitro group was confirmed by using Attenuated Total Reflectance Fourier Transform Infra-Red (ATR-FTIR) analysis as the presence of nitro peak at 1646 and 1355 cm^{-1} with the highest degree of substitution is 0.74 determined by elemental analysis. Glass transition temperatures were increased towards acidic condition, thus contribute to the degree of crystallinity increment from 37 to 69% calculated from XRD. The highest ionic conductivity of nitrochitosan was $\sim 10^{-6} \text{ cm}^{-1}$.

Keywords: Nitrochitosan, chitosan derivatives, conductivity

SYNTHESIS OF MAGNETIC NANOPARTICLES DEEP EUTECTIC SOLVENT AS ADSORBENTS FOR REMOVAL OF DICLOFENAC IN ENVIRONMENTAL SAMPLES.

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Abstract

Magnetic nanoparticles modified with deep eutectic solvent (MNP-DES) has been successfully synthesised by co-precipitation method. The structure of MNP-DES was examined by Fourier Transform Infrared Spectroscopy (FTIR), Field Emission Scanning Electron Microscope (FESEM), Transmission Electron Microscope (TEM) and X-ray Diffraction (XRD). In this study, the MNP-DES has been employed as an adsorbents for removal of diclofenac in environmental samples. The modified magnetic nanoparticles based DES has showed great ability and performance for removal of diclofenac with removal percentage up to 95% compare to native magnetic nanoparticles which only has 30% removal percentage.

Keywords: magnetic nanoparticles, deep eutectic solvent, diclofenac

SYNTHESIS OF POROUS THIOAMIDE-MODIFIED POLY(ACRYLONITRILE-*CO*-DIVINYLBENZENE-80) SORBENTS FOR THE CAPTURE OF POLAR ANALYTES

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Abstract

Pharmaceuticals contain biologically active components that can pollute water courses as a result of excretion from individuals and/or the uncontrolled release of residues from chemical plants, and this can pose a hazard to health. Pharmaceutical residues can persist at low concentrations in the environment, and thus may be potentially harmful to aquatic animals and to humans. The control and monitoring of such residues is therefore of prime interest by, for example, solid-phase extraction using solid sorbents to purify and preconcentrate the residues prior to their chemical analysis. In the present work, poly(acrylonitrile-*co*-divinylbenzene-80) sorbents were synthesised by varying the comonomer feed ratios under precipitation polymerisation conditions to deliver a family of porous polymer microspheres. Acrylonitrile confers polar character onto the sorbents, and the acrylonitrile-derived nitrile groups can be chemically transformed *via* polymer-analogous reactions into thioamide residues which makes the sorbents even more suitable for the capture of polar analytes, including selected pharmaceuticals. The utility of the porous thioamide-containing sorbents was demonstrated *via* the solid-phase extraction of mefenamic acid from aqueous media; mefenamic acid is an anthranilic acid derivative which is a potent, non-steroidal anti-inflammatory drug which is found in environmental waters at low concentrations.

Keywords: Polyacrylonitrile, chemical modification, thiourea, polar pharmaceuticals, solid-phase extraction

SYNTHESIS AND LIQUID CRYSTAL PROPERTIES OF NEW AZO-ESTER LINKED MATERIALS

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Abstract

Azo-ester linked materials had been familiarise with its useful properties towards photoresponsive and photosensitive materials for lots of technological devices such as the LCD television, calculator, mobile phone and etc. Therefore a series of azo-ester linked mesogen with a lateral methyl substituted containing liquid crystalline acrylate compound **C1-C3** by having different electron-withdrawing group (-Cl, -Br, -CN) were successfully synthesised and characterised. Compounds prepared were characterised by infrared and ¹H-NMR spectroscopy, and their mesophase behaviour is investigated by Differential Scanning Calorimetry (DSC) and identified by Polarised Light Microscopy (POM). Meanwhile, the thermal stability will be examined through Thermogravimetric Analysis (TGA)

Keywords: azo-ester linked materials, lateral methyl substituted, mesophase behaviour, thermal stability

PREPARATION AND CHARACTERISATION OF HYDROXYAPATITE EXTRACTED FROM FISH SCALE WASTE FOR THE REMOVAL OF GALLIC ACID AS INHIBITOR IN BIOFUEL PRODUCTION

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Abstract

Acid pretreatment of lignocellulosic waste to produce fermentable sugar for production of bioethanol and biofuel has created phenolic compounds, aliphatic acid, and furfural which are recognised as inhibitor to the fermentation process that reduce the final yield product. This study is a preliminary study that aimed on the potential of hydroxyapatite (HAp) extracted from fish scale for phenolic compound (gallic acid as model solution) removal. HAp was extracted by modified enzymatic hydrolysis with various temperatures (500 oC, 600 oC, 700 oC, 800 oC, 900 oC, 1000 oC) of 4 hours calcination. The extracted HAp was characterised using Fourier Transform Infrared spectroscopy (FTIR), X-Ray Diffraction (XRD), and Scanning Electron Microscope (SEM). Batch adsorption was conducted to select the best adsorbent and to study the effect of initial concentration, time, dosage, and temperature. The batch adsorption experiment was performed and the result shows the gallic acid removal of 78.9% in 100 mg/l initial concentration gallic acid adhered by HAp800. This adsorption process fitted more to Freundlich isotherm ($r^2 = 0.9951$) compared to Langmuir isotherm. The kinetics of adsorption most fitted with pseudo second-order (0.996).

Keywords: Batch adsorption; Langmuir; Freundlich; First-order; Pseudo second-order

SYNTHESIS OF LIQUID CRYSTALS WITH LATERAL METHYL GROUP AND THEIR MESOMORPHIC PROPERTIES

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Abstract

A series of new liquid crystalline materials containing azo-ester linkage with lateral methyl substitution and different terminal unit which consists of alkoxy groups substituents ($-\text{OCH}_3$, $-\text{OCH}_2\text{CH}_3$ and $-\text{OCH}_2\text{CH}_2\text{CH}_3$) was synthesized and characterized. The mesomorphic behavior, thermal stability, optical properties were investigated by using differential scanning calorimetry (DSC), optical polarizing microscopy (POM), and thermogravimetric analyzer (TGA).

Keywords: Synthesis; azo-ester; lateral methyl; alkoxy; mesomorph phase behavior; optical property

ELECTROCHEMICAL PROPERTIES OF MESOPOROUS SILICA-CARBON ELECTRODE

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Abstract

Mesoporous silica is material that possesses the pore sizes between 2 nm to 50 nm which had expanded their applications rapidly. In this study, mesostructured SBA-15 with pore sizes 5.5 nm was successfully synthesized by surfactant templating technique, using triblock copolymer pluronic (P123) as directing agent and tetraethyl orthosilicate (TEOS) as silica sources. The synthesized material was characterized using various techniques including X-Ray diffraction (XRD), scanning electron microscope (SEM), N₂ adsorption-desorption and infra-red (IR). Two different electrodes were fabricated which carbon paste electrode (CPE) and modified carbon paste electrode (SBA-15/MCPE) and analysed using cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). The SBA-15/MCPE offer better adsorption and enhanced the response signal to 48% and results lower resistance compared to CPE with 179 Ω and 187 Ω respectively. This study demonstrates that mesoporous silica (SBA-15) can be considered as promising material in development of high performance, lightweight and flexible devices in electrochemistry.

Keywords: mesoporous silica; SBA-15; electrochemical properties; mesoporous silica-carbon electrode

ENHANCED CYTOTOXICITY OF RUTHENIUM COMPLEX CARRIED BY MESOPOROUS SILICA NANOPARTICLES

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Abstract

Mesoporous silica nanoparticles (MSN) are amongst the nanomaterials that garnered research interests as potential drug carrier due to the fine tuning of morphology and porosity of the material. In this experiment, a phenanthroline salt, 1-hexadecyl-1,10-phenanthroline bromide (Phen-C₁₆) was used as a template in a co-condensation method to prepare silica nanoparticles. The template was removed and the mesoporous silica nanoparticles with average size of 75 nm to 80 nm were loaded with a potential anti-cancer ruthenium drug, Ru(dppz)₂PIP]²⁺. The average loading percentage is 25%, making the concentration of ruthenium complex at 5.17 μM in 1 mg of MSN. The cytotoxicity of the ruthenium complex, the MSN and the MSN loaded with the ruthenium complex (MSN-Ru) towards cervical cancer cells, Hela were done *via* MTT-assay. The ruthenium complex is barely toxic with IC₅₀ 38 μM while the bare MSN were mostly non-toxic with ED₅₀ value above 100 μg. Remarkably, the ED₅₀ of the drug loaded MSN is 16.69 μg which hold approximately 0.056 μM of ruthenium complex in concentration. This indicates that the cytotoxicity of ruthenium complex Ru(dppz)₂PIP]²⁺ against the Hela cells were enhanced by using MSN as a carrier.

Keywords: mesoporous silica nanoparticles; ruthenium; cytotoxicity; drug carrier

EXTRACTION AND CHARACTERIZATION OF MICROFIBRILLATED AND NANOFIBRILLATED CELLULOSE FROM OFFICE PAPER WASTE

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Abstract

The tremendous increased in papermaking and cellulose production, which both sources from wood pulp has resulted in severe exploitation of trees, leading to environmental problems, the deforestation. Besides, the reduction of paper usage is rather not in the horizon. Thus, concerning with the environmental issue, the extraction of cellulose from the paper waste can be an alternative initiative to mitigate the negative impact via reusability of paper waste. In this study, the extraction of cellulose microfibrils and nanofibrils were achieved using office paper waste as the source material. Alkali and bleaching treatments were employed for the extraction of cellulose fibers followed by controlled-conditions of acid hydrolysis for the isolation of the cellulose nanofibrils. The alkali treatment was carried out using various concentrations of 2%, 4%, 8% and 16% of sodium hydroxide (NaOH) solution while the bleaching treatment was carried out using sodium hypochlorite (NaClO) solution. The extraction of nanofibrillated cellulose was achieved using controlled-conditions of acid hydrolysis treatment with various concentrations of 5%, 15%, 30% and 60% sulphuric acid (H₂SO₄). Structural and functional groups analysis was analyzed using Attenuated Total Reflection Fourier Transform Infra-Red (ATR-FTIR) while imaging and morphological analysis was examined using optical microscopy and transmission electron microscopy (TEM). FTIR analysis indicated the lignin, ink, fillers and other components were removed after alkali and bleaching treatments. Imaging analysis using optical microscope showed a fibrous and rod-like structure of the extracted cellulose while TEM images showed that the size of the cellulose extracted range from micro to nano size down to ~20-30 nm depending on the concentration of acid used. The extraction of either microfibrillated or nanofibrillated cellulose from office paper waste in this work might paves the way toward alternative reuse of office paper waste in cellulose materials production and application.

Keywords: cellulose; microfibrillated; nanofibrillated; office paper waste

SYNTHESIS OF FOUR ARMS STAR POLYMER FOR HYDROGEL FORMULATION

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Abstract

Star-shaped polymer can be described as macromolecules with multi-armed polymeric material with a huge potential in biomedical applications. This study investigated the effect of molecular architecture of amphiphilic star polymers in drug formulation for wound healing application. Four arms star-shaped block copolymers constructed of polyethylene glycol (PEG) as hydrophilic block and polycaprolactone (PCL) as hydrophobic block were synthesized via combination of Steglich Reaction and ring opening polymerization (ROP). ¹H NMR and FTIR analysis shows that the four star-shaped polymers is successfully synthesized. XRD analysis of the polymers shows that PEG decrease the crystallinity of the polymers. Thermal analysis (XRD and DSC) shows the thermal stability difference between homopolymer star and block copolymer star in which modification of end-group affect their thermal stability. The polydispersity index (PDI) indices from GPC were narrow suggesting controlled polymerization reaction. Preparation of hydrogel formulation shows the presence of PEG in the polymers increase the hydrophilicity and solubility in water. Drug loading of the formulation with Ciprofloxacin as drug cargo indicating high entrapment efficiency of the drug towards star-shaped polymer formulation.

Keywords: star-shaped block copolymer; Ring opening polymerization; hydrogel formulation

DEVELOPMENT OF IONIC LIQUID BASED MAGNETIC NANOPARTICLES FOR THE EXTRACTION OF ORGANIC COMPOUNDS FROM VARIOUS MATRIXES

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Abstract

In the present work, few types of magnetic nanoparticles functionalized ionic liquid material have been developed for the extraction of organic compounds from various matrixes. In this study, first application will be focused on the magnetic polyaniline functionalized dicationic ionic liquid for the extraction of polycyclic aromatic hydrocarbon. The second application will be focused on the magnetic cyclodextrin loaded ionic liquid polymer for the extraction of parabens and third application will be focused more towards cyclodextrin functionalized with new type of ionic liquid for the determination of polycyclic aromatic hydrocarbons in the food samples. All the nanomaterials are well synthesized and characterized. The influences of several experimental variables such as ionic strength, amount of sorbents, volume of extractant solvent pH, extraction and desorption time, sample volume, strength and volume of desorption solvent have been considered in depth during the optimization process to achieve the best extraction efficiency. The developed methods are validated and applied towards various real samples. The developed methods are found to be sensitivity with higher adsorption capacity towards all the studied analytes. The methods also were found to simple, efficient, remarkably free from interference effects and comparable with previous work.

Keywords: ionic liquid; cyclodextrin; polyaniline; extraction; real samples