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Natural Resources Product Prospects - International Conference on Fluids and Chemical Engineering-FluidChE 2017, Malaysia

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Abstract

The 2nd edition of Fluids and Chemical Engineering conference, FluidsChE 2017 held in April 2017 at Kota Kinabalu, Sabah is organised by the Center of Excellence for Advanced Research in Fluid Flow (CARIFF) Universiti Malaysia Pahang, Malaysia. FluidsChE 2017 covers a wide area of engineering and sciences with the theme "Advancing Fluids Engineering for A Sustainable Future". Over 200 submissions were received from countries such as India, Iraq, Pakistan, Indonesia, Malaysia, Thailand, Kazakhstan and Qatar. More than 100 full papers were submitted for the special issue. After an extensive peer-review process, 66 papers were finally selected for publication. The current special issue volume consisted of natural resources product lifecycle, polymer technology and pharmaceutical technology.

Keywords: FluidChE 2017, Natural Resources, Polymer Technology, Pharmaceutical Technology

1. Introduction

In the serenade of moonlight, melancholy music of Antonio Stradivari's violin filled the colossal concert halls to exhilarate the soul of the audience[1]. The violins used were only few hundred grams in weight. In the advert of architecture, he never would have thought of to double the thickness of the wood on safety grounds. If designed increased wood content the tunes would be more of tree trunk noises.

The evolving industrial worldscape — a welter of start-ups, monocultures and multinationals, most clinging to business-as-usual — contributes a dynamic unpredictability. Technology solution providers need to learn from metamorphosis than as a "MAKER" creation. Fundamental challenge lies in the selection of most effective raw materials to get the most effective and economical produce with commercial usage. For purchasing power of the global middle class keeps ding dong, in population surge and crowd to 5.2 billion by 2030 from current (2017) 3.1 billion.

The United States world's supreme nation in terms of both economical and intellectual deliverables, sends 40% of its food to landfill and discards 70–80% of the 145 million tonnes of construction and demolition debris that it generates each year — even though much of the wood, metal and minerals is recyclable then mind goes berserk of the waste management and raw materials selection scenario of the underdeveloped countries[2]. Taking very successful evolution of birds as the take home message, they have evolved in response to particularly intense selective pressure on weight resulting in maximum strength and minimum mass.

This volume 2 deals with publications on product life cycle from natural resources, polymer technology and pharmaceutical technology. Take home message of this volume will be technology, science and wellness of life to and should congeal.

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A review on natural fibers has been published. This review article[3] gives an overview of the utilization of bamboo fiber to be a valuable product and an alternate component for expensive and non-sustainable synthetic fibers. Also dearth in tested data on bamboo fibers makes this review a very important source of information on bamboo fibers.

Organic natural obtained from Pegaga has been reported. Substantial variation among *C. asiatica* accessions has been found. Biochemical content among different accessions has been characterised. glucose, chlorophyll, β-carotene and individual flavonoid compounds were analysed. UMP03 accession shows tremendous potential which can go for field testing to the agricultural plantation.

HPLC-UV was tried in a publication using ionic liquid impregnated agarose film LPME technique for the extraction of tricyclic drugs. By employing this know-how river water sample was used for the extraction which proved it's prosperity by achieving relative recovery of around 80%.

Simultaneous extraction of Total Phenolic Content (TPC) and Total Flavonoid Content (TFC) was simultaneously extracted using a mixture of water and a lower polar solvent in a publication by group working on fluid dynamics. *Phyllanthus niruri* was used as the raw material. Maximum TPC and TFC obtained was of 119.28 GAE mg /g DW and 75.86 QE mg /g DW. Dry weight of the raw material is denoted as DW.

Cellulase and xylanase has great potential as an industrial enzyme for waste degradation into fermentable sugars which used as a feedstock for bioethanol production. Sungai Ikan in Kuala Terangganu, Malaysia has a large landfill from which soil samples were collected to isolate bacterial strains. Upon 130 bacterial strains 50 isolates produced cellulase and 30 other isolates exhibited xylanase activity. B6.2 isolate exhibited the highest cellulase activity (endoglucanase 19.797 U/mL and FPase 7.384 U/mL) and M29 isolate exhibited the highest activity of xylanase (5399 U/mL).

In this publication, starch was converted to cyclodextrin by cyclization reaction by CyclodextrinGlucanotransferase (CGTase). *Bacillus licheniformis* produced α-cyclodex tringlucanotransferase (α-CGTase) was characterized. SDS-PAGE analysis was carried out for molecular weight determination. Methyl orange assay for α-CGTase activity, thermal stability and pH effect on maximum activity was also carried out.The molecular weight of α-CGTase was estimated to be 70 kDa, maximum activity at 40°C with pH 6.0.

Phytoremediation process was made possible for sulphide removal using *Scirpusgrossus* plant in this publication. *Scirpusgrossus* plant was exposed to synthetic spent sulfidic caustic (SSC) in the concentration range of 0.2-4.24 mg/L. Leaves withering was the test end point. At maximum concentration of 4.24 mg/L, 44% leaves withering was observed but from green chemistry perspective phytoremediation has successfully reduced the pH, COD and sulphide concentration of SSC.

Ferulic acid (FA) is commonly used in food and cosmetic industry. In an article, physical extraction process parameters were optimized using factorial design. Banana stem waste obtained from banana plantation was the raw material used. Sugarcane press machine was utilized for physical extraction of FA from banana stem waste. Storage time of the extracted BSW juice (EBJ) was studied upon. Numerical model prediction gave maximum FA yield of 0.2162 mg/g with storage time of 24.1 h which was substantiated with the experimental data which gave a maximum yield of 0.2274 mg/g.

Factorial design was also used in another publication for biobutanol production process optimization. *Clostridium acetobutylicum* ATCC 824 utilized oil palm frond (OPF) juice as its energy source for biobutanol production. inoculum size, temperature and agitation speed was the optimization parameters to be evaluated. 20% inoculum size, temperature at 37°C and 50 rpm agitation speed process optimization yielded a maximum of 0.19 g/g-sugar butanol (50 g/l OPF juice).

In a publication low cost adsorbent system for ammonia nitrogen recovery using modified empty fruit bunch (EFB) fibers was worked upon. Alkali treatment of the raw material EFB was carried out for the Sorption-desorption studies of ammonia nitrogen into the modified EFB fibers. The maximum sorption capacity was found to be 0.53-10.89 mg/g and maximum desorption capacity of 0.0999 mg/g was achieved. FTIR was carried out for characterization of different versions of raw materials used.

Char reuse in co-gasification process with coconut shell biomass for syngas production was attempted in an article. simulation studies tested and trained using ASPEN PLUS showed higher syngas production. Experimental results correlated well giving an increase in syngas production by the co-gasification of reused char with coconut shell.30% addition of reused char showed higher syngas production.

Sago solution at different concentrations mixed with silver nitrate solution (1 mM) was used for the production of silver nanoparticles in this publication.

Metroxylonsagu (true sago palm) is a species of palm in the genus Metroxylon. Thus produced silver nanoparticles upon characterization showed a particle size of 17 ± 6.7 nm and absorbance peak at 415 nm in the UV-Vis spectra. Antimicrobial activity showed cell lysis for gram positive and gram negative bacteria

Empty Fruit Bunch (EFB) is one of the main solid wastes from the palm oil industry which has great prospects to be used for renewable energy. Oxidative torrefaction was carried out, characterization done and compared with untreated EFB. Torrefaction process conditions are temperatures at 240°C and 280°C and carrier gases used were N2 and CO2. Conventional torrefaction process parameters involve only N2. Additional mixing of CO2 to N2 carrier gas gave better biomass for further usage of renewable energy

Photoinitiated dispersion polymerization synthesis was carried out for the production of macroparticles of PMEV. Chemical characterization using FTIR spectral studies indicated the successful attachment of the entire functional groups to the backbone of the polymer molecules. Initially, this polymerization synthesis was tried using two different raw materials namely, PSEV and PMEV. Based on the initial confirmatory results supported PMEV to be more efficient, hence was selected for advanced investigations.

Hypercrosslinking reaction system was carried out in this publication for the synthesis of HypercrosslinkedPoly(HEMA-co-EGDMA-co-VBC) hydrophilic polymer. Addition of vinyl benzene chloride (VBC) and Ethylene glycol dimethylacrylate (EGDMA) at different concentrations changes specific surface area (SSA). Characterization of the synthesized polymer was carried out using FTIR and BET analysis. Results indicated VBC addition increased SSA which is a critical parameter for catalytic activity.

In another publication dry/wet phase inversion technique was used upon for the synthesis of thin film composite namely, PVDF/ Pebax 1657. Casting temperature was the process parameter optimized for the fabrication of PVDF/ Pebax 1657 TFC membrane. Casting temperature need to be considered while fabrication of the membrane, which is evident from the results. 60 °C was found to be the apt temperature for efficient gas selective separation process.

Superabsorbent polymers (SAP) synthesis has been reported in this publication. Graft polymerization method was utilized. Biochar particles were used as fillers. Using 0.4% biochar filler concentration major property of SAPs which is water absorbency capacity increased to a value of 129 g/g. The results showed further increase of biochar fillers to 0.8% from 0.6% had a negative effect on its prime property of water absorbency capacity.

Carbamazepine-saccharin (CBZ-SAC) co-crystals were evaluated in this article for process parameters. crystallization kinetics parameters, seed loading and seeding temperature strongly determines the effective synthesized crystal size distribution. Seeding concentration nearing the solubility curve (at 46.05°C) ended up in larger crystal size morphology in comparison with the seed addition near to metastable zone limit.

Co-crystallization process design was worked out by a team working on crystallization has come up with an article on carbamazepine-saccharin (CBZ-SAC) co-crystal formation. Increase in MSZW value was found for increased CBZ concentration and stirring speeds resulting in smaller crystal size.

Surface modification of nanocrystalline cellulose (NCC) has been published by a Malaysia Palm Oil Board and Universiti Malaysia Pahang. Hyperbranched polymer (HBP) with hydroxyl terminal groups ends was used. Surface morphology microscopy imaging revealed HBP was coated only on the surface without altering the chemical moieties of NCC. FTIR results showed the presence of HBP only on the surface of NCC.

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