

Chemical Engineering Allied Fields - International Conference on Fluids and Chemical Engineering- FluidsChE 2017, Malaysia, Special Issue, Vol: 3

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Abstract

The International Conference on Fluids and Chemical Engineering (FluidsChE 2017) organised by Centre for Excellence for Advanced Research in Fluid Flow (CARIFF), Universiti Malaysia Pahang, Malaysia (FluidsChE 2017) aims to provide a platform to discuss ideas and latest research findings on different disciplines of chemical engineering. 1st FluidsChE 2015 was conducted in Langkawi, Malaysia in November, 2015 which stirred and kindled intellectual minds to make this event a biannual event to disseminate knowledge and findings of chemical engineering fields to the entire world. As an outcome of the event 60+ research articles are published in reputed journals which are in open access for all spectrums of researchers to gain knowledge. Research publications were sectioned into three volumes, volume -1, 2 and 3. First volume was segmented into these disciplines of fluid flow dynamics, distillation technology and absorption / adsorption technology. Second volume consisted of natural resources product lifecycle, polymer technology and pharmaceutical technology. Third volume contains allied fields of chemical engineering. Researchers from different parts of the world contributed to the knowledge pool. Convergence was seen where researchers from different disciplines collaborated for technology solution support for product development with feasible techno economics with prospects for successful commercialization.

Keywords: Chemical Engineering, FluidsChe 2017, Malaysia, Cariff, Sabah

1. Introduction

World's first four-year chemical engineering curriculum was started by a chemistry professor Lewis M. Norton in 1888 and was named as Course X. at MIT. Course X combined mechanical engineering and industrial chemistry. In 1907, MIT became the first school to award Ph.D. degrees in chemical engineering¹. American Institute of Chemical Engineers came into existence in 1908². So much so as now the course and curriculum has evolved, that with the chemical engineering perspective, day in day out products enter the commercial market for diversified applications to be used in air, water and soil from robot in Mars, identification of bioaccumulation in

the deepest ocean³ to vaginal drug delivery for cervical cancer treatment⁴. In terms of equipment design for example, electrospinning technology point of view, chemical engineering has evolved the spinneret of the nanofibers production unit from single needle tip to needleless wire electrode^{5,6} thereby increasing the productivity several folds of the nanocarriers.

An article⁷ from Petronas University evaluated the correlation between resistivity and soil properties. Cohesion and resistivity was measured upon and found a statistically significant correlation. For friction angle and plasticity index (PI) with resistivity, limited inference has been obtained which need to be further evaluated.

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Catalytic kinetic studies was carried out in this article⁸ using cation exchange resins, sulfonated hypercross-linked exchange resins (SHER), RCP160M and SK104H. Activation energy and rate constant for the forward reaction was determined. POLYMATH 6.10 program was interfaced by using three different kinetic models, pseudo homogeneous (PH), Eley-Rideal (ER) and Langmuir-Hinshelwood-Hougen-Watson (LHHW) for correlation of the experimental data to the simulated data. Results upon inference revealed chemical step determined the reaction rate step ($E_a > 15 \text{ kJ mol}^{-1}$).

Research group from Iraq are using firefly algorithm⁹ for studying the BLDC motor. Classical firefly, PSO optimization and segmentation methods were used for evaluation. PID control parameters were optimized. Further studies are on the verge of a deliverables.

Water curing and air curing method were analysed for using egg shell as an additive for cement¹⁰. 15% concentration of egg shell proved to give greater strength for the neat cement. Compressive strength of the eggshell concrete was determined for a 28 days study. Using full water curing and open air curing Compressive strength were found to be 49.23 MPa and 46.34MPa respectively.

Iraq - Malaysia research collaboration on non-Newtonian Jeffrey Micropolar Fluid was initiated. This article¹¹ showed Deborah number and Prandtl number have greater influence on the fluid dynamics. Deborah number influenced the rotational motion of the micro fluid. Also it was found that Deborah number had a very telling effect on fluid velocity.

Cobalt stearate (CS) addition to polyethylene terephthalate (PET) boosted the thermal degradation of PET in this article¹². Mechanical and physical properties of PET were altered by the addition of CS to PET. PET-CS composites were characterized by using FTIR and SEM imaging.

Energy analysis was carried out in this publication by comparing water heat losses (WHL) and exhaust heat losses (EHL)¹³. It was found that EHL was more influential at higher engine speeds in the range of 2500 to 4000 rpm. This category of energy loss determination in future can pave way for energy loss determinations in spark ignition engines.

Aligned magnetohydrodynamics (MHD) was studied¹⁴ in this article. Numerical mathematical modelling using MATLAB was carried out and found that by obtaining the momentum and energy equations influenced the flow and heat transfer. The inferred data can give good

insights for non-Newtonian fluid dynamics issues using mathematical numerical modelling supported by experimental data.

Conductor like Screening Model for Real Solvents (COSMO-RS)¹⁵ was found to be a very competent procedure for ionic liquids (ILs) screening protocol. Goal of this article is to find a suitable ILs for SiO_2 dissolution. It has been found out that ammonium cation and sulfate anion at a specific combination proved to be a very effective ILs for SiO_2 dissolution.

Common type of connection for steel beams use bolted connections¹⁶. Finite Element Analysis (FEA) was used to compare conventional method for bolted beam connections. FEA was able generate reliable data having a potential for scale-up activities. By undergoing in-depth research with the inclusion of several other parameters to FEA lacunae can be overcome which will facilitate for acquiring permissions for the EU market.

A review article¹⁷ on wood plastic composites (WPCs) has been published using simulation models. Compression moulding process has been simulated and front end interfacing with Graphic User Interface (GUI) has been suggested. In this review article a need for the researchers to take up front to take for next level rather than leaving aside after model validation. Requirement for simulation software to be used by collaborative researchers from other domains has also been recommended.

In this article¹⁸ sol-gel method was utilized for the synthesis of Ni/Ce-SBA-15 (NCS). The product exhibited larger surface area ($670.69 \text{ m}^2 \text{ g}^{-1}$). Ni/Ce-SBA-7 (NCS7), synthesized catalyst depicted improved catalytic activity with CH_4 conversion, CO_2 conversion and H_2/CO ratio of 94.9%, 95.1%, and 0.99. The used catalyst was characterized for its physicochemical properties by XRD, BET, TEM and FTIR.

The article on Gebeng bauxite ore¹⁹ reports the physical properties of Gebeng bauxite ore and its international export commodity potentials. Plenitude fine particles attachment to the bauxite ore makes the raw material not suitable for export. Reason being absorbance of moisture is facilitated by fine particles resulting in increase of bulk density values. International Maritime Solid Bulk Cargoes (IMSBC) Code classification denies code C for Gebeng bauxite ore rendering it unfit for export. A solution has been suggested to make the ore a better quality, elimination of fine particles by beneficiation to be the solution.

An article on non-destructive testing using eddy current²⁰ for deep crack detection showed quantum crack

size in the test sample affected the amount of eddy current signal. Weld probe was used as the inspection detection sensor. Detection sensitivity basically rely on the interactive behaviour of the crack length direction and eddy current flow.

Voltage stability indicator performance has been conducted in this article²¹. Voltage stability assessment method was employed for critical analysis for the protection of the transmission line from overloading.

Thermoplastic Polyurethane-Sugar Palm Fibre Reinforced composite was evaluated for its mechanical and viscoelasticity properties in this publication²². Chemical treatment using KMnO_4 and NaOH was carried out. Tensile properties, tensile strength, young's modulus, and the elongation at break were examined. ASTM D-638 specification standards were followed. At a maximum concentration of 0.125% of KMnO_4 , highest tensile strength was obtained. Upon treatment with 6% NaOH TPU/SPF composites showed lower efficiency in terms of mechanical and visco-elasticity properties when compared to KMnO_4 treatment.

Successful integration of Model predictive control (MPC) and Kalman filter (KF) has been reported in this article²³. Regulation of propane mole-fraction was taken as the case study. Observations reveal integration of MPC and KF ease up linear offset free MPC. Simulink-Matlab was used for the simulation of the dynamic depropanizer process in Hysys.

Motion artifact (MA) using photodiode and three axis accelerometer has been published. Covered photodetector as a dependable MA reflector was promulgated²⁴. A real reference signal was to be generated on the promulgated concept. The results very much augmented the existing concept which paves way for a prospect to be used as a healthcare application for disease diagnosis and prognosis.

Waste reduction using the generated waste in a quarry has been published²⁵. Clay bricks are manufactured in the sand quarry, huge amount of fine particles as quarry dust are produced which are toxic in nature. Waste reduction at the source of generation is a type which needs cutting edge technology. waste reduction by reusing the waste is more apt for high volume wastes. Quarry dust waste were embedded into fired clay bricks at a maximum quantity of 30% in weight of the final product. Leachability analysis proved very successful. The results are in line with the stringent global regulatory body stipulations. has a great potential to be a commercial success.

2. References

1. <http://web.mit.edu/cheme/about/history.html>
2. <http://people.clarkson.edu/~wwilcox/Design/evolvcbe.pdf>
3. Jamieson AJ, Malkocs T, Piertney SB, Fujii T, Zhang Z. Bioaccumulation of Persistent Organic Pollutants in the Deepest Ocean Fauna. *Nature (Ecology and Evolution)* 2017; 1: 0051 Crossref, Crossref
4. Castle PE. Gynaecological Cancer: New Standard of Care—HPV Testing for Cervical Cancer Screening. *Nature (Reviews Clinical Oncology)*. 2015; 12: 194–196. Crossref, Crossref
5. Forward KM, Rutledge GC. Free Surface Electrospinning from a Wire Electrode. *Chemical Engineering Journal*. 2012; 183:492–503. Crossref
6. Ramakrishnan R, Gimbun J, Samsuri F, Narayanamurthy V, Gajendran N, Sudha Lakshmi Y, Denisa Stranska D, Ranganathan B. Needleless Electrospinning Technology – An Entrepreneurial Perspective. *Indian Journal of Science and Technology*. 9(15): Crossref
7. Jusoh H, Osman SB. The Correlation between Resistivity and Soil Properties as an Alternative to Soil Investigation. *Indian J of Science and Technology*. 2017; 10: Crossref
8. Yunus NM, Roslan NA, Chin SY, Abidin SZ. Kinetic Studies of Free Fatty Acid Esterification Using Cation Exchange Resins as Catalyst. *Indian J of Science and Technology*. 2017; 10:
9. Jaber AS. A Novel Tuning Method of PID Controller for a BLDC Motor Based on Segmentation of Firefly Algorithm. *Indian J of Science and Technology*. 2017; 10
10. Yu TY, Ing DS, Choo CS. The Effect of Different Curing Methods on the Compressive Strength of Eggshell Concrete. *Indian J of Science and Technology*. 2017; 10: Crossref
11. Al-Sharifi HAM, Kasim ARM, Salleh MZ, Shafie S. Numerical Solutions on Flow and Heat Transfer of non-Newtonian Jeffrey Micropolar Fluid. *Indian J of Science and Technology*. 2017; 10
12. Chelliah A, Subramaniam M, Gupta R, Gupta A. Evaluation on the Thermo-Oxidative Degradation of PET Using Prodegradant Additives. *Indian J of Science and Technology*. 2017 February; 10(6):1–5. Crossref
13. Yusri IM, Mamat R, Azmi WH, Awad OI, Othman MF, Rosdi SM. Influences of Gasoline Fuels on Waste Heat Recovery Potentiality of a Spark Ignition Engine. *Indian J of Science and Technology*. 2017; 10
14. Al-Sharifi HAM, Kasim ARM, Aziz LA, Salleh MZ, Shafie S. Influence of Aligned Magnetohydrodynamic of Jeffrey Fluid across a Stretching Sheet. *Indian J of Science and Technology*. 2017; 10
15. Man MS, Abdullah MAM, Abdullah SB, Yaacob Z. Screening Cation and Anion of Ionic Liquid for Dissolution

- of Silicon Dioxide Using COSMO-RS. *Indian J of Science and Technology*. 2017 ; 10: Crossref
16. Al Fakh K, Chin SC, Doh SI. A Review on Finite Element Analysis of Beam to Column Bolted Connection. *Indian J of Science and Technology*. 2017; 10
 17. Gupta R, Noraziah A, Gupta A, Abdalla AN. Overview of Simulation in Wood Plastic Composites Manufacturing. *Indian J of Science and Technology*. 2017; 10
 18. Ab Ghazab NAN, Setiabudi HD, Chin Sim Yee CS, Ainirazali N. CO₂ Dry Reforming of Methane Over Ni/Ce-SBA-15: Effects of Ce addition. *Indian J of Science and Technology*. 2017; 10
 19. Hasan M, Aziz SH, WanJusoh WN. Basic Properties of Gebeng Bauxite in Accordance to IMSBC Code. *Indian J of Science and Technology*. 2017; 10:
 20. Faraj MA, Abdalla AN, Samsuri F, Rifai D, Kharudin Ali K. Investigate of the Effect of Width Defect on Eddy Current Testing Signals under Different Materials. *Indian J of Science and Technology*. 2017; 10. Crossref
 21. Ali AA, Abdalla AN, Ishat R. Effect of DG Optimizing on overload Transmission Line Stability. *Indian J of Science and Technology*. 2017; 10
 22. Mohammed AA, Bachtiar D, Rejab MRM, Hasany SF. Effect of Potassium Permanganate on Tensile Properties of Sugar Palm Fibre Reinforced Thermoplastic Polyurethane. *Indian J of Science and Technology*. 2017; 10
 23. Tuan TT, Tufa LD, Ibrahim M, Mutalib A, Olakunle KA. An Hysys Simulation of a Dynamic Process Using Linear Offset Free MPC with an Empirical Model. *Indian J of Science and Technology*. 2017;10
 24. Hasan MA, Fahmi Samsuri F, Gan KB. A Correlation Study on Motion Artifact Using Photodiode and Three Axis Accelerometer Signals. *Indian J of Science and Technology*. 2017; 10
 25. Kadir AA, Hassan MH, Sarani NA, Ahmad Shayuti Abdul Rahim AS, Ismail N. Leachability of Quarry Dust Waste Incorporated into Fired Clay Brick using TCLP. *Indian Journal of Science and Technology*. 2017; 10