

Pakistan Journal of Scientific and Industrial Research

Series A: Physical Sciences

Vol. 58, No.3, September-October, 2015



(for on-line access please visit web-site <http://www.pjsir.org>)

Published by
Scientific Information Centre
Pakistan Council of Scientific and Industrial Research
Karachi, Pakistan

Pakistan Journal of Scientific and Industrial Research

Series A: Physical Sciences

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Series B: Biological Sciences [ISSN 2221-6421 (Print); ISSN 2223-2567 (online)] (appearing as issues of March-April, July-August and November-December).

Each Series will appear three times in a year.

This Journal is indexed/abstracted in Biological Abstracts and Biological Abstracts Reports, Chemical Abstracts, Geo Abstracts, CAB International, BioSciences Information Service, Zoological Record, BIOSIS, NISC, NSDP, Current Contents, CCAB, Rapra Polymer Database, Reviews and Meetings and their CD-ROM counterparts etc.

Subscription rates (including handling and Air Mail postage): *Local:* Rs. 2500 per volume, single issue Rs. 425; *Foreign:* US\$ 450 per volume, single issue US\$ 75.

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Printed and Published by: PCSIR Scientific Information Centre, PCSIR Laboratories Campus, Shahrah-e-Dr. Salimuzzaman Siddiqui, Karachi-75280, Pakistan.

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Revising Subscription Rates

Despite, increasing cost we refrained from revising subscription in last ten years. But in view of tremendous increase in cost of printing material and printing and in postage rates, it becomes imperative for us to take decision on revising the rates due to present circumstances. Following are the revised Subscription rates from January 2015

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Executive Editor

S_N2 Mechanism of Cationic Micelles on the Hydrolysis of Bis-*p*-Methoxyphenyl Phosphate Ester

Abanish Kumar

Department of Chemistry, BSA College, Mathura - 281004, UP, India

(received February 21, 2014; revised August 11, 2014; accepted August 20, 2014)

Abstract. Hydrolysis of bis-*p*-methoxyphenyl phosphate ester (bis-*p*-MPPE) was studied in micellar solutions of cetyltrimethylammoniumbromide n-C₁₆H₃₃N⁺(CH₃)₃Br⁻ (CTABr) at pH-9.0. The hydrolysis followed first order kinetics with respect to bis-*p*-MPPE concentration. At the concentration of critical micelle concentration (CMC) the rate of hydrolysis increased with increasing CTABr concentration. Surfactant with cationic or polar head group form micelles in water with hydrocarbon like interior or polar groups at the surface and bind cationic solute. The binding constant of micelle for bis-*p*-MPPE and the rate constant in micellar pseudo phase were determined from kinetic data using the pseudophase model.

Keywords: micelle, bis-*p*-methoxyphenyl phosphate ester, reaction mechanism, binding constant, critical micelle concentration, surfactant

Evaluation of Physicochemical and Biodegradability Properties of Selected Nigerian Non-Edible Oilseeds as Potential Cutting Fluids

Titilope John Jayeoye^{ab*}, Mary Bosede Ogundiran^b, David Abimbola Fadare^c and Adeniyi Adewale Ogunjobi^d

^aDepartment of Chemistry, Federal University Ndufu Alike Ikwo, Abakaliki, Ebonyi State, Nigeria

^bAnalytical/Environmental Unit, Department of Chemistry, University of Ibadan, Nigeria

^cDepartment of Mechanical Engineering, University of Ibadan, Nigeria

^dDepartment of Microbiology, University of Ibadan, Nigeria

(received February 25, 2014; revised September 17, 2014; accepted September 18, 2014)

Abstract. This paper reports evaluation of physicochemical and biodegradability properties of selected non edible Nigerian oilseeds as a potential cutting fluid. Oil extraction process was carried on the oilseeds, with physicochemical parameters and biodegradability of the extracts were equally assessed. The established physicochemical parameters were percentage oil yield (5.58-61.8%), specific gravity (0.86-0.94), acid value (2.89-18.2 mgKOH/g), iodine value (15.7-104 mg iodine/g), peroxide value (1.35-10.9 mg/g oil), saponification value (173-286 mg KOH/g) and viscosity (37.9-53.1centipoises), while biodegradability ranged between (50.0-63.8%) in comparison with the mineral oil with values less than 20%. Based on this study, the oil extracts of *Caesalpinia bonduc* and *Calophyllum inophyllum* appeared to be the most suitable as potential cutting fluids for further formulation studies and machining trials.

Keywords: cutting fluids, vegetable oilseeds, biodegradability, bacterial inoculums

Effect of Heat Treatment on Yield and Quality of Loofah (*Luffa cylindrica* Linn.) Seed Oil

Rahman Akinoso^{*a}, Ademola Kabir Aremu^b and Nnena Akosim^a

^aDepartment of Food Technology, University of Ibadan, Nigeria

^bDepartment of Agricultural and Environmental Engineering, University of Ibadan, Nigeria

(received May 30, 2014; revised November 7, 2014; accepted November 13, 2014)

Abstract. Effect of heat treatment on yield and some quality parameters of loofah seed (*Luffa cylindrica* Linn.) oil was the focus of this study. Central composite rotatable response surface methodology design for two variables was used for this investigation. Fatty acid composition of the un-treated oil was determined. The independent variables roasting temperature were 102, 110, 130, 150, 158 °C and duration 16, 20, 30, 40, 44 min while oil yield, moisture content, free fatty acid, colour, refractive index and specific gravity of the oil were the dependent variables. All determinations were done using standard methods. Linoleic acid (50.66%), oleic acid (27.66%), palmitic acid (12.28%) and stearic acid (6.44%) were the major fatty acids. Mean oil yield, moisture, free fatty acid, colour, refractive index and specific gravity were 25.91±5.16%, 0.035±0.003%, 5.3±2.47%, 15.23±1.83 mg/100g, 1.47±0.002 ND⁴⁰ and 0.913±0.02, respectively. All the parameters were significantly affected by heat treatment (p<0.05). Regression models were not fit to express the relation, thus optimisation using response surface approach was not adequate.

Keywords: *Luffa cylindrica*, heat treatment, seed oil, yield

Effect of Reconstitution Solvents and Containers on Kinetics and Safety of Cephadrine Neutralised with L-Arginine

Aman ullah Khan^a, Javeid Iqbal^a, Saif-ur-Rehman Khattak^{b*}, Najam-us-Saqib^b and Muhammad Saleem Qazi^c

^aFaculty of Pharmacy, Hamdard University, Muhammad Bin Qasim Avenue, Karachi-74600, Pakistan

^bCentral Drugs Laboratory, DRAP, Block-B, S.M.C.H.S Karachi, Pakistan

^cPharmaceutical Research Centre, PCSIR Laboratories Complex, Karachi-75280, Pakistan

(received March 5, 2014; revised August 14, 2014; accepted August 15, 2014)

Abstract: The effect of reconstitution solvents such as water, 0.5% metronidazole solution, 0.9% sodium chloride and 5% dextrose injections, have been investigated on the kinetics of degradation of cephradine neutralised with L-arginine contained in glass, polyvinylchloride (PVC) and polyethylene phthalate (PET) containers at 5, 15 and 30 °C. The analytical method described in USP-31 for the analysis of cephradine injection was employed in this study and validation in respect of specificity, linearity, accuracy and precision was observed. The degradation of the compound showed first-order kinetics and the degradation rate constants ' k_{obs} ' were found in the range of $1.84-3.07 \times 10^{-3}/h$ ($r^2 = 0.990-0.999$) at 5 °C, $2.3-4.2 \times 10^{-3}/h$ ($r^2 = 0.993-0.999$) at 15 °C and $7.18-9.97 \times 10^{-3}/h$ ($r^2 = 0.998-0.999$) at 30 °C, respectively. Cephradine showed maximum stability in dextrose solution followed by water, sodium chloride and metronidazole injections, however, linear effect of containers on degradation rate could not be established. The extended degradation did not change the kinetics of the reaction. The abnormal toxicity/ safety test on mice for the admixtures in different containers at various temperatures showed no abnormal toxicity.

Keywords. cephradine, degradation kinetics, polyvinyl chloride, polyethylene phthalate, abnormal toxicity

Downstream Wind Flow Path Diversion and Its Effects on the Performance of Vertical Axis Wind Turbine

Abdul Latif Maganhar^a, Altaf Hussain Rajpar^{*a}, Saleem Raza Samo^b and Muhammad Ramzan Luhur

^aMechanical Engineering Department, Quaid-e-Awam University of Engineering, Science and Technology, Nawabshah, Pakistan

^bEnergy and Environment Engineering Department, Quaid-e-Awam University of Engineering, Science and Technology, Nawabshah, Pakistan

(received April 21, 2014; revised September 29, 2014; accepted October 2, 2014)

Abstract. In the present experimental study efforts have been made to analyse path diversion effect of downstream wind flow on performance of vertical axis wind turbine (VAWT). For the blockage of downstream wind flow path at various linear displaced positions, a normal erected flat wall, semi-circular and cylindrical shapes were tested for path diverting geometries. Performance of VAWT in terms of improved rotor speed up to 45% was achieved.

Keywords: upstream flow, downstream flow, wind diversion, vertical wall, wind turbine

Evaluation of the Impact of Continuously Regenerating Trap on Volatile Organic Compounds Emitted from Turbocharged Diesel Engine

Asad Naeem Shah^{ab*}, Ge Yun-shan^b, Muhammad Mehmood Aslam Bhutta^a,
Anees Ur Rehman^a, Ahmad Naveed^a and Muhammad Imran Masood^a

^aDepartment of Mechanical Engineering, University of Engineering and Technology,
Lahore-54000, Pakistan

^bSchool of Mechanical and Vehicular Engineering, Beijing Institute of Technology,
Beijing-100081, PR China

(received January 20, 2014; revised May 30, 2014; accepted June 16, 2014)

Abstract. In this study a continuously regenerating trap (CRT) was evaluated on the basis of its performance to control the volatile organic compounds (VOCs) emitted from the diesel engine exhaust. The engine was operated on a test bench by coupling it through an AC electrical dynamometer under the auspices of an 8-mode steady-state cycle. VOCs in their gaseous phase were trapped in Tenax TA[®] cartridge, and then extracted by thermal desorber (TD) for the subsequent analysis through gas chromatograph-mass spectrometer (GC/MS). According to the results, VOCs were preponderant during both maximum as well as minimum load modes owing to the incomplete combustion. Benzene and toluene were in abundance with respective maximum relative contribution (RC) of 40.3 and 34.7% in upstream of CRT, while toluene and ethyl benzene were the dominant species with respective maximum RC of 38.2 and 30.8% in downstream of CRT. Styrene and butyl acetate were the least contributors to total VOCs in both upstream as well as downstream of CRT. The CRT unit revealed a good control on VOCs with maximum reduction rate (R_R) of 45%. The R_R of VOCs was decreased with the decrease in NO_2/NO_x ratio, while the R_R of benzene was reduced with the reduction in downstream temperature leading to strong correlations between them. Moreover, the R_R trend of both benzene and ethyl benzene led to an important finding that when former was substantially reduced with maximum R_R , the latter remained elevated with higher negative R_R . Hence, an anti-correlation was found between benzene and ethyl benzene.

Keywords: continuously regenerating trap, compression ignition engine, unregulated emissions, volatile organic compounds

Adsorption Performance of Modified Nkalagu Bentonite in Dye Removal: Kinetics, Equilibrium, Thermodynamics and Structural Properties of the Modified Samples

Regina Obiageli Ajemba

Department of Chemical Engineering, Nnamdi Azikiwe University, P.M.B. 5025,
Awka, Anambra, Nigeria

(received February 3, 2014; revised August 14, 2014; accepted August 15, 2014)

Abstract. The adsorption performance of modified Nkalagu bentonite in removing Congo red (CR) from solution was investigated. The raw bentonite was modified by three different physicochemical methods: thermal activation (TA), acid activation (AA), and combined acid and thermal activation (ATA). The Congo red adsorption increased with increase in contact time, initial dye concentration, adsorbent dosage, temperature, and pH change. The results of the kinetics analysis of the adsorption data revealed that adsorption follows pseudo second-order kinetics. Analysis of the equilibrium data showed that Langmuir isotherm provided a better fit to the data. Evaluation of the thermodynamic parameters revealed that adsorption process is spontaneous and endothermic. The results from this study suggest that a combination of thermal and acid activation is an effective modification method to improve adsorption capacity of bentonite and makes the bentonite as low-cost adsorbent for removal of water pollutants.

Keywords: adsorption, bentonite modification, kinetics, equilibrium, thermodynamics, dye removal

Short Communication

Prediction of Five-day Biochemical Oxygen Demand (BOD₅) from Chemical Oxygen Demand (COD) Values in Raw and Biologically Treated Domestic Sewage

Ita Eregho Uwidia* and Christopher Ejeomo

Department of Chemistry, University of Benin, Benin City, Nigeria

(received April 1, 2014; revised August 27, 2014; accepted August 28, 2014)

Abstract. The functional relationship between BOD₅ and COD was evaluated using domestic sewage samples collected from a sewage treatment plant in an estate in Warri, Delta State, Nigeria. Two types of samples were collected: raw domestic sewage,(influent) and biologically treated domestic sewage (effluent).The correlation coefficient ‘r’ between the BOD₅ and COD was determined and values were 0.99 and 0.94, respectively for different sewage samples. The regression analysis carried out showed very strong correlation . The linear correlation established was: $COD = 1.62 BOD_5 + 15.82$; $r^2 = 0.978$; $COD = 1.58BOD_5 + 9.21$; $r^2 = 0.878$. Results obtained above were also judged as significant at 95% and 99% confidence levels. Confidence intervals obtained were: $1.53 \leq a \leq 1.71$ at 95% and $1.49 \leq a \leq 1.75$ at 99% for the raw sewage; $1.37 \leq a \leq 1.80$ at 95% and $1.27 \leq a \leq 1.90$ at 99% for the biologically treated sewage.

Keywords: prediction, BOD₅, COD, correlation, regression analysis, domestic sewage, wastewater

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