PULP/PAPER

NPARR 2(1), 2011-082, **Treatment of pulp and paper industry bleaching effluent by electrocoagulant process**

The experiments were carried out in an electrocoagulation reactor with aluminum as sacrificial electrodes. The influence of electrolysis time, current density, pH, NaCl concentration, rotational speed of the stirrer and electrode distance on reduction of color, COD and BOD were studied in detail. From the experimental results, 15 mA/cm^2 current density, pH of 7, 1g/l NaCl, 100 rpm, 28°C temperature and 3cm electrode distance were found to be optimum for maximum reduction of color, COD and BOD. The reduction of color, COD and BOD under the optimum condition were found to be 94%, 90% and 87% respectively. The electrode energy consumption was calculated and found to be varied from 10.1 to 12.9 kWh/m^3 depending on the operating conditions. Under optimal operating condition such as 15mA/cm^2 current density, pH of 7, 1g/l NaCl, 100 rpm, 28 °C temperature and 3cm electrode distance, the operating cost was found to be 1.56 US $\$/m^3$. The experimental results proved that the electrocoagulation is a suitable method for treating bleaching plant effluents for reuse [R. Sridhar, V. Sivakumar*, V. Prince Immanuel and J. Prakash Maran (Department of Chemical Engineering, Kongu Engineering College, Perundurai, Erode 638052, TN, India*), Journal of Hazardous Materials*, 2011, **186**(2-3), 1495-1502].

NPARR 2(1), 2011-083, **Acoustical and fire-retardant properties of jute composite materials**

This research aims to study the acoustical and flammability properties of biodegradable and easily disposable natural fibre jute and its composite for noise reduction in house hold appliances, automotive and architectural applications. Acoustical properties of jute fibre and felt (natural rubber latex jute composite) were measured in terms of normal specific sound absorption coefficient and sound transmission loss whereas fire retardant tests included limiting oxygen, flame propagation and smoke density test. The results illustrate that low density jute is a better sound absorber as compared to high density jute material, moreover natural rubber latex jute composite gives higher sound transmission class value than jute felt/cloth. Results were also compared with commercially available synthetic, non-biodegradable, glass fibre which indicates that the noise reduction coefficient value and sound transmission class rating of natural rubber latex jute felt are comparable to that of the popular fibre glass. Fire retardant tests show composite's high limiting oxygen index value as compared to fibreboard and other natural sound absorbing material, wool, low smoke density rating and low light absorption with respect to fibre glass as well as self fire extinguishing ability [S. Fatima and A.R. Mohanty*(Department of Mechanical Engineering, Indian Institute of Technology, Kharagpur, West Bengal 721 302, India), *Applied Acoustics,* 2011, 72(2-3), 108-114].

NPARR 2(1), 2011-084, **Completely biodegradable soyprotein–jute biocomposites developed using water without any chemicals as plasticizer**

Soyprotein–jute fiber composites developed using water without any chemicals as the plasticizer show much better flexural and tensile properties than polypropylene–jute composites. Co-products of soybean processing such as soy oil, soyprotein concentrate and soy protein isolates are inexpensive, abundantly available and are renewable resources that have been extensively studied as potential matrix materials to develop biodegradable composites. However, previous attempts on developing soy-based composites have either chemically modified the co-products or used plasticizers such as glycerol. Chemical modifications make the composites expensive and less environmentally friendly and plasticizers decrease the properties of the composites. In this research, soyprotein composites reinforced with jute fibers have been developed using water without any chemicals as plasticizer. The effects of water on the thermal behavior of soyproteins and composite fabrication conditions on the flexural, tensile and acoustic properties of the composites have been studied. Soyprotein composites developed in this research have excellent flexural strength, tensile strength and tensile modulus, much higher than polypropylene (PP)–jute fiber composites. The soyprotein composites have better properties than the PP composites even at high relative humidity (90%) [Narendra Reddy and Yiqi Yang*(Department of

Textiles, Clothing & Design, 234, HECO Building, University of Nebraska-Lincoln, Lincoln, NE 68583-0802, USA), *Industrial Crops and Products,* 2011, **33**(1), 35-41].

NPARR 2(1), 2011-085, **Nano-SiO_2 filled rice husk/polypropylene composites: Physico-mechanical properties**

In this research, reinforcing effect of hybrid filler including rice husk (RH), beech bark (BB) and nano-SiO_2, in polypropylene has been investigated. In the sample preparation, four levels of filler loading were used for waste lignocellulosic materials (55–58 wt.%) and nano-SiO_2 (0–4 wt.%). In order to increase the interphase adhesion, polypropylene grafted with maleic anhydride was added as a coupling agent to all the composites studied. The physical properties, viz. the thickness swelling and water absorption, and mechanical properties, namely, the tensile, flexural and notched Izod impact strengths, of the composites were determined. Generally, high amount of filler content in composites can lead to the reduction of interfacial adhesion between matrix polymer and filler, and it limits their applications. The results showed that while flexural properties and elongation at break were moderately improved by the increase in the amount of filler in the matrix, tensile and Izod impact strengths decreased dramatically. However, the composites had acceptable mechanical strength levels. The mechanical properties of composites filled with RH are generally greater than BB composites. The thickness swelling and water absorption of the composites increased with the increase in the filler loading, but to a negligible extent as compared with the wood-based composites and the solid woods. Nano-SiO_2 addition showed little positive [Amir Nourbakhsh, Foad Farhani Baghlani and Alireza Ashori*(Department of Chemical Technologies, Iranian Research Organization for Science and Technology (IROST), P.O. Box 15815-3538, Tehran, Iran), *Industrial Crops and Products*, 2011, **33**(1), 183-187].

NPARR 2(1), 2011-086, **Biocomposites based on flax short fibres and linseed oil**

Insulating materials based on flax short fibres were prepared and their functional properties enhanced using linseed oil. In order to improve biocomposites hydrophobicity, the linseed oil was added to the initial formulation, mixed with the fibres and finally dried after the moulding process. Thus, the average water absorption of 10–40/140 g/g oil/fibres samples was reduced up to 10 times during the first hour of immersion, compared to the reference oil-free materials. Moreover, the linseed oil polymerization inside the lignocellulosic matrix, which occurred after 20 days of drying at 50 °C, also improved mechanical and thermal behaviour of biocomposites. Spontaneous combustion phenomena related to the exothermic oxidation–polymerization of linseed oil were described as well. Therefore, the process parameters such as oil/fibres ratio, drying time and temperature, were optimized to ensure the safety of the process and to avoid self ignition of the lignocellulosic fraction at temperatures below 200 C [J. Lazko*, B. Dupré, R.M. Dheilly and M. Quéneudec (Laboratoire des Technologies Innovantes (EA 3899), Université de Picardie Jules Verne, CODEM Picardie, 41, rue Paul Claudel, 80480 Dury, France), *Industrial Crops and Products*, 2011, 33(2), 317-324].

NPARR 2(1), 2011-087, **Oil palm fiber (OPF) and its composites: A review**

Twenty first century has witnessed remarkable achievements in green technology in material science through the development of biocomposites. Oil palm fiber (OPF) extracted from the empty fruit bunches is proven as a good raw material for biocomposites. The cellulose content of OPF is in the range of 43%–65% and lignin content is in the range of 13%–25%. A compilation of the morphology, chemical constituents and properties of OPF as reported by various researchers are collected and presented in this paper. The suitability of OPF in various polymeric matrices such as natural rubber, polypropylene, polyvinyl chloride, phenol formaldehyde, polyurethane, epoxy, polyester, etc. to form biocomposites as reported by various researchers in the recent past is compiled. The properties of these composites *viz.*, physical, mechanical, water sorption, thermal, degradation, electrical properties, etc. are summerised. Oil palm fiber loading in some polymeric matrices improved the strength of the resulting composites whereas less strength was observed in some cases. The composites became more hydrophilic upon addition of OPF. However treatments on fiber surface improved the composite properties. Alkali treatment on OPF is

preferred for improving the fiber–matrix adhesion compared to other treatments. The effect of various treatments on the properties of OPF and that of resulting composites reported by various researchers is compiled in this paper. The thermal stability, dielectric constant, electrical conductivity, etc. of the composites improved upon incorporation of OPF. The strength properties reduced upon weathering/degradation. Sisal fiber was reported as a good combination with OPF in hybrid composite [S. Shinoj, R. Visvanathan, S. Panigrahi*and M. Kochubabu (Department of Agricultural and Bioresource Engineering, University of Saskatchewan, 57 Campus Drive, Saskatoon, SK S7N5A9, Canada), *Industrial Crops and Products*, 2011, **33**(1), 7-22].

NPARR 2(1), 2011-088, **Cellulosic pulp from *Leucaena diversifolia* by soda–ethanol pulping process**

A selection of the best wood raw materials for cellulose pulp and papermaking from five varieties of the Leucaena has been made (*Leucaena diversifolia*, *Leucaena collinsii* and three varieties of *Leucaena leucocephala*) with growth periods of one, two and three years. In accordance with biomass production and the features of the raw materials and cellulose pulp obtained, *L. diversifolia* in its second year of growth was selected as the most suitable material for pulp and papermaking. Pulping of *L. diversifolia* by soda–ethanol was studied using an experimental design in order to investigate the effects of cooking variables: temperature, time, soda concentration, ethanol concentration and wash-disintegrate temperature on the chemical composition of the obtained pulps (yield, kappa number, viscosity, solubles substances, lignin, holocellulose and α-cellulose contents) and the physico-chemical characteristics of paper sheets (tensile index). The results were evaluated using the response surface methodology. The optimum pulping conditions were established for this lignocellulosic material, using the model predictions. The pulp obtained at these conditions has suitable chemical (pulp) and physical (paper sheets) characteristics: yield (46.5%), 1%NaOH solubles (3.04%), hot water solubles (0.63%), ethanol–benzene extractives (0.44%), holocellulose contents (96.7%), α-cellulose contents (75.8%), lignin contents (0.85%), viscosity (1367) kappa number (15.2) and tensile index (19.2 kN m/kg) [F. López, A. Pérez*, J.C. García, M.J. Feria, M.M. García and M. Fernández (Department of Chemical Engineering, Faculty of Experimental Sciences, University of Huelva, Campus of Carmen, Huelva, Spain), *Chemical Engineering Journal,* 2011, **166**(1), 22-29].