FIBRES (incl. Textile and other utility fibres)

NPARR 5(1), 2014-024 Characterization and analysis of ligno-cellulosic seed fiber from Pergularia daemia plant for textile applications

A hitherto uninvestigated ligno-cellulosic seed fiber from the plant Pergularia daemia has been chosen for the current study to unravel its physical properties, and potentialities in textile applications. The raw, NaOH treated, and wax removed fibers were tested for their morphological and structural features by X-ray diffraction, SEM, FT-IR spectra, and thermal analysis by thermogravimetry and differential scanning calorimetry. The raw fibers have low cellulose content and less crystalline compared to cotton and are having hollow, smooth surface, and less density. The brittle nature and low elongation at break of virgin fiber makes it difficult for the spinning. It becomes spinnable after NaOH treatment due to the increased elongation at break by partial removal of lignin [T. Karthik and R. Murugan (Department of Textile Technology, PSG College of Technology, Coimbatore, 641004, Tamil Nadu, India), Fibers and Polymers, 2013, 14(3), 465-472].

NPARR 5(1), 2014-025 Effects of fibre-surface morphology on the mechanical properties of Porifera-inspired rubber-matrix composites

In this paper, mineralised organic fibre morphologies, inspired by the structures of Porifera (sponges) are correlated to the mechanical performance of fibre reinforced rubbers. The mineralised structures are rich in calcium carbonate and silica. These compounds nucleate and precipitate on the fibre surfaces yielding different morphologies as a function of mineral ion concentrations. Smaller mineralised precipitates manifestly improve the mechanical performance of composites while thicker precipitates enveloping the fibres give rise to inferior properties. Mechanisms and evidenced reasoning for these differences are reported herein [Parvez Alam*, Daniela Graf Stillfried, Jessika Celli and Martti Toivakka (Centre for Functional Materials, Abo Akademi University, Porthaninkatu 3, 20500, Turku, Finland), Applied Physics A, 2013, 111 (4), 1031-1036].

NPARR 5(1), 2014-026 Use of sugar cane straw as a source of cellulose for textile fiber production

This paper reports the development of textile fibers from cellulose of sugar cane straw and commercial cellulose. Sugar cane straw pulps were obtained after alkaline pulping, using soda/anthraquinone (AQ). For the removal of residual lignin, pulps were submitted to chemical bleaching with hydrogen peroxide. Bleached pulps were used to obtain fibers with N-methylmorpholine-N-oxide (NMMO). Straw and pulps were characterized for their chemical composition (cellulose, polyoses and lignin). Fibers were analyzed to evaluate maximum water uptake or swelling, weight loss and mechanical properties. Microstructure was analyzed by a scanning electron microscope (SEM). Pulping yield was 30%, and fibers showed water uptake capacity around 60–73%. The mass loss profile was about 25-26% in 30 days. Fibers obtained from commercial cellulose and straw presented tenacity values in the range of 4.1-4.3 cN/tex, which are compatible with commercial lyocell produced from wood pulp cellulose [Sirlene M. Costa*, Priscila G. Mazzola, Juliana C.A.R. Silva, Richard Pahl and Adalberto Pessoa Jr., ((School of Arts, Sciences and Humanities, Textile and Fashion Course, University of São Paulo, Av. Arlindo Bélio, 1000, Parque Ecológico do Tieté, Ermelino Matarazzo, CEP: 03828-080 São Paulo, SP, Brazil), Industrial Crops and Products, 2013, 42, 189-194]

NPARR 5(1), 2014-027 Effect of jute and kapok fibers on properties of thermoplastic cassava starch composites
Since mechanical properties and water uptake of biodegradable thermoplastic cassava starch (TPCS) was still the main disadvantages for many applications. The TPCS matrix was, therefore, reinforced by two types of cellulosic fibers, i.e. jute or kapok fibers; classified as the low and high oil absorbency characteristics, respectively. The TPCS, plasticized by glycerol, was compounded by internal mixer and shaped by compression molding machine. It was found that water absorption of the TPCS/jute fiber and TPCS/kapok fiber composites was clearly reduced by the addition of the cellulosic fibers. Moreover, stress at maximum load and Young’s modulus of the composites increased significantly by the incorporation of both jute and kapok fibers. Thermal degradation temperature, determined from thermogravimetric analysis (TGA), of the TPCS matrix increased by the addition of jute fibers; however, thermal degradation temperature decreased by the addition of kapok fibers. Functional group analysis and morphology of the TPCS/jute fiber and TPCS/kapok fiber composites were also examined using Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM) techniques [Jutarat Prachayawarakorn*, Sudarat Chaiwatyothin, Suwat Mueangta and Areeya Hanchana, (Department of Chemistry, Faculty of Science, King Mongkut’s Institute of Technology Ladkrabang, Ladkrabang, Bangkok 10520, Thailand), Materials & Design, 2013, 47, 309-315].