FIBRES (incl. Textile and other utility fibres)

NPARR 3(1), 2012-021, Could oleaginous flax fibers be used as reinforcement for polymers?

Many works deal with the mechanical properties of flax fibers cultivated for textile applications and today used for the reinforcement of polymers. Nevertheless, quantities of oleaginous flax fiber are obtained each year and not promoted. The aim of this work is to study the mechanical properties of single linseed flax fiber as a function of variety, culture year, dew-retting degree and agronomic factors. Five varieties of oleaginous flax have been characterized by tensile tests on elementary fibers and compared to four varieties of textile flax. These tensile experiments have been carried out with the same equipment, experimental protocol and environmental conditions.

The results show that interesting mechanical properties were obtained with the oleaginous variety and are close of those of textile varieties, such as Agatha or Electra. Considering the diameters and specific properties of these oleaginous fibers, we evidenced that they are good candidates for the substitution of glass fibers in composite materials. To increase the development of flax fibers, it is important to have a better control of the spread of their mechanical properties. This point could be observed with the Everest variety cultivated for 4 years and no conclusion could be made. It has been observed that the retting degree has no influence on the diameters and mechanical properties of the fibers; the same conclusion is obtained with agronomic factors such as seeding rate and plant height [Isabelle Pillin*, Antoine Kervoejena, Alain Bourmauda, Jérémy Gomardb, Nicolas Montrelaya and Christophe Baley (Université de Bretagne Sud, Laboratoire d’Ingénierie des MATériaux de Bretagne, Rue de St Maudé, BP 92116, 56321 Lorient Cedex, France), Industrial Crops and Products, 2011, 34 1556-1563].

NPARR 3(1), 2012-022, Comparative study of pulping of banana stem

Banana stem has no use after harvesting the fruit, which is used for manufacturing of pulp for the production of fiber, film and paper. Pulping is done to liberate the fibers from lignin and hemicelluloses, which can be accomplished chemically or mechanically or by combining these two type of treatment. Chemical pulping is characterized by the use of chemicals to separate the lignin fraction of lignocelluloses materials from the cellulose. Chemical separation results in little or no effect on the fiber length. Kappa number, yield, viscosity limit index (cm3/gm) is used to describe the extent of lignin removal in the cooking process. There are five pulping techniques, namely kraft process, sulphite process, soda process, formic acid /acetic acid solvent and Urea/NaOH solvent system were studied [Manish Kumar* and Deepak Kumar (Department of Textile Chemistry D.K.T.E. Society”s Textile & Engineering Institute “Rajwada”, Ichalkaranji, Dist-Kolhapur), International Journal of Fiber and Textile Research, 2011, 1(1), 1-5].

NPARR 3(1), 2012-023, Mechanical properties of randomly oriented short Sansevieria trifasciata fibre/epoxy composites

The tensile, flexural and impact properties of randomly oriented short Sansevieria trifasciata fiber/epoxy (STFE) composites were evaluated. Composites were fabricated using raw Sansevieria trifasciata fiber (STFs) with varying lengths (mm) and weight (%) percents of fibers viz. 10(30), 20(35), 30(40) and 40 (45). When the length of the STFs was increased, the tensile, flexural and impact strength properties of the composites were increased up to a 30mm fiber length, and then curtailment of properties occurred when fiber length was further increased. All the fibers were treated with alkali solution and yet composites were prepared by hand lay-up method. STFE composites showed a regular trend of an increase in properties with fiber weight percent until 40% and afterwards a decrease in properties of composites with greater fiber weight percent. Tensile tests revealed that the tensile strength was about 75.22 MPa, the Young’s modulus was 1.05 GPa and the elongation at the break was 10.07%. The flexural strength and modulus were estimated around 82.33MPa, 3GPa, respectively. Impact tests exhibited strength of approximately 8.97J/cm2. The analysis of the tensile, flexural and impact properties of short STFE composites displayed a critical fiber length and
optimum fiber weight percent of 30\% and 40\%, respectively. Scanning electron microscope (SEM) studies were carried out to evaluate the fiber/matrix interactions when fiber weight increased. FTIR studies indicated functional groups could engage in the covalent and hydrogen bonds formation. Chemical resistances of the STFE composites were significantly improved for all chemicals except for Toluene. These results indicate that high performance all natural products composite materials can be developed from the resources that are readily available locally [M. Ashok Kumar*, G. Ramachandra Reddy, G. Harinatha Reddy, K. V. P. Chakradhar, Bh. Nanjunda Reddy and N. Subbaram Reddy (Saint Mark Group of Institutions, Department of Mechanical Engineering Rachanapalli, Ballary Road, Anantapur, Andhra Pradesh, India), *International Journal of Fiber and Textile Research, 2011, 1(1), 6-10].

NPARR 3(1), 2012-024, Fabrication and performance of natural fibers: Sansevieria cylindrica, waste silk, jute and drumstick vegetable fibres (Moringa Oleifera) reinforced with rubber/polyester composites

Aim of this work was to investigate the tensile, flexural and dielectric properties of composites made by reinforcing Sansevieria cylindrica as a new natural fibre into a rubber based polyester matrix. The fibres extracted by retting and manual processes were used to fabricate the composites. These composites were tested for the properties which mentioned above and compared with those of established composites like waste silk, drumstick vegetable fiber and jute made under the ASTM conditions. The composites were fabricated up to a maximum volume fraction of fibre of 0.35 for impact testing, tensile, flexural and dielectric testing. It was observed that the tensile properties were increased with respect to volume fraction of fibre for Sansevieria cylindrica fibre composite and are also more than those of silk and drumstick composites and comparable to those of jute composites. The flexural strength of Sansevieria cylindrica fibre composite is more than that of waste silk composite and is closer to drumstick fibre composite with respect to the volume fraction of fibre, where as the flexural modulus is much higher than those of jute, drumstick vegetable fibre composites and also very much closer to silk fibre composites. The dielectric strength of Sansevieria cylindrica fibre composite was increased with increase in volume fraction of fibre in the composite unlike the case of waste silk, jute and drumstick tree vegetable fibre composites. The dielectric strength being a unique feature of Sansevieria cylindrica fibre composite can be suggested for electrical insulation applications [Ashok Kumar*, G. Ramachandra Reddy, K. R. Vishnu Mahesh, Thimmapuram Hemanth Babu, G. Vasanth Kumar Reddy, H. Dasaratha and Y. V. Mohana Reddy (Principal, Saint Mark Group of Institutions, Department of Mechanical Engineering, Rachanapalli, Ballary Road, Anantapur-515003, Andhra Pradesh, India), *International Journal of Fiber and Textile Research, 2011, 1(1) 15-21].

NPARR 3(1), 2012-025, Performance of Zea mays fiber reinforced epoxy composites

The tensile properties of unidirectional and randomly oriented short fibre lengths from agricultural based plant stems Zea mays (Poaceae) fibre/ epoxy composites (ZMFE) are described for the first time in this work. Composites were fabricated using raw Zea mays fiber (ZMF’s) with varying fibre weight percents viz. 25, 30, 35, 40 and 45wt \%. The tensile parameter such as maximum stress, Young’s modulus and elongation at break were determined using the universal testing machine (UTM). Wet hand lay-up technique was used for the preparation of the composite. Effect of alkali treatment (with and without 10 \% NaOH solution) of ZMFE composites were also studied on the tensile properties. ZMFE composites showed a regular trend of an increase in properties with fibre weight percent until 40\% and afterwards a decrease in properties for composites with greater fibre weight percent. It was observed that the increased performance was attributed for unidirectional fabric was due to the narrow interface between the fabric and matrix, there by stress transfer between increased. The analysis of the tensile parameters of short ZMFE composites displayed an optimum fibre weight percent at 40 wt \%. Scanning electron microscope (SEM) studies were carried out.
to evaluate the fibre/matrix interactions. DSC, TGA and FT-IR spectra of treated and untreated ZMFE composites were also studied [M. Ashok Kumar*, G. Ramachandra Reddy, K. R. Vishnu Mahesh, K.V. P. Chakradhar and Y. V. Mohana Reddy (Saint Mark Group of Institutions, Department of Mechanical Engineering, Rachanapalli, Ballary Road, Anantapur-515003, Andhra Pradesh, India), International Journal of Fiber and Textile Research 2011, 1(1), 22-27].