Title Pineapple leaf fibres - Composites applications at macro and nano scales

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Abstract

Cellulose nanofibres were extracted from the agricultural residues, pineapple leafs by hydrothermal chemi-mechanical technique to examine their potential for use as reinforcement fibres in biocomposite applications. The morphological structure of the cellulose nanofibres was investigated by Environmental Scanning Electron Microscopy (ESEM), Atomic Force Microscopy (AFM) and Transmission Electron Microscopy (TEM). The obtained pineapple leaf nanofibres were determined to have diameters in the range of 520 nm and lengths of 200-250 nm. Chemical characterization of the PALF nanofibres confirmed that a sharp increase in a-cellulose content was observed by steam coupled acid treatment. FT-IR spectroscopic analysis of the prepared fibres demonstrated that this chemical treatment also led to partial removal of hemicelluloses and lignin from the structure of the fibres to obtain highly pure cellulose. PXRD yesults revealed that this resulted in enhanced crystallinity of the fibres. The thermal properties of disintegrated and individualized nanofibres were studied by the TGA technique and found to increase dramatically. The degradation temperature of the developed nanofibre reached beyond 400°C. This value is reasonably promising for the use of these nanofibres in reinforcedpolymer manufacturing. Mechanical properties indicated that the use of PALF cellulose nanofibres induced a mechanical percolation phenomenon leading to outstanding and unusual mechanical properties through the formation of a rigid filler network in the matrix. X-ray diffraction proved significant change in 'the crystallinity of the matrix with the incorporation of cellulose nanofibres.