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COTTON-BASED NANOCOMPOSITE FIBERS: CHARACTERIZATION AND PROCESSING

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Abstract

In the last decade, polymer-clay nanocomposites have attracted a great deal of research interest. The existing literature shows that the production of nanocomposites using montmorillonite clays as fillers with synthetic polymers as the matrix is common practice. Flame retardant textiles have been produced from the polyamide-6 (Nylon 6)/clay nanocomposite system. The current research produced cotton/clay nanocomposites for possible use in flame retardant textiles or the coatings industry. The large surface area to volume ratio of montmorillonite clays provides a substantial interfacial region in the nanocomposite. The relatively large interfacial region is expected to provide significant enhancement in tensile and thermal properties of the cellulose with a low percentage incorporation of the filler materials. Nanocomposite materials were produced in varying composition from 0% to 15% filler material. Several cellulose sources were examined in relation to the nanocomposites made with cellulose from cotton. Initial characterization of the nanocomposites was performed via X-ray diffraction, thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). Characterization of the materials confirmed that they were true nanocomposites and the materials have improved thermal properties when compared to cellulose itself. Nanocomposite and regenerated cellulose fibers were produced on a laboratory scale for preliminary mechanical analysis.