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Statistical Evaluation of Microwave Assisted Mercerization of Date Palm Tree Fibers

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Abstract

Using renewable materials like date palm agro-waste for manufacturing bio-composites could contribute to reducing the shortage of raw materials for Wood Plastic Composites (WPC) industry as well as diminishing environmental problems regarding the residues disposal. However, few works have targeted to the agro-residues, especially the date palm pedicels. Moreover, proper modification of natural fillers is a primary stage toward improved filler/polymer compatibility. However, the existed filler treatment focus on the modification of the surface to obtain better filler/polymer compatibility. In this study, a novel production of cellulosic-rich filler from date palm pedicels agro-residues using microwave assisted multistep chemical treatment is introduced. The processing steps are the surface dewaxing, bleaching, and alkalization. Each step is optimized based on the required objective. Moreover, the alkalization is optimized using design of experiment approach in order to determine the processing parameters effect on the filler structure which is analyzed using X-Ray Diffraction (XRD). The aim of this work is to optimize a novel multistep chemical treatment assisted with microwave to produce cellulosic-rich fillers for high-performance bio-composites using microwave assisted multistep chemical treatment. The presented method enhances the surface modification and purity, and filler performance for optimal filler crystallinity.