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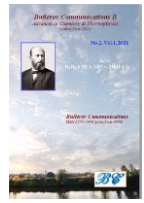

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New cellulose nitrates: synthesis and characterization

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Abstract

The object of this study was two new, conceptually distinct raw sources: cellulose isolated from *Miscanthus×giganteus* var. KAMIS, and synthetic cellulose derived by electropolymerization of glucose. This study aimed to synthesize cellulose nitrates therefrom and compare their properties. The major findings from this study include the samples of cellulose nitrates obtained in 156 and 168% yields, which samples exhibit a 100% solubility in acetone, 11.26 and 11.83% nitrogen contents, 52 and 198 mPa·s viscosities, 91 and 95% solubilities in alcohol-ester solvent, and 0.05 and 0.13 % ash contents, respectively. FTIR spectroscopy revealed the basic functional groups at 2560-2553, 1642-1626, 1276-1271, 830-814, 746 and 686-677 cm^{-1} that identify the synthesized products as being cellulose nitroesters. SEM showed a conceptual difference in the morphological structure of the fibers between the cellulose nitrate samples, and the CN fibers obtained from the synthetic cellulose were found to be homogeneous. The X-ray diffraction technique estimated the index of crystallinity of the resultant esters at 4.3% for CN from *Miscanthus* cellulose and at 7.0% for CN from the synthetic cellulose. DSC/TGA discovered a high chemical purity of the cellulose nitrates from both raw

sources, close onset temperatures of decomposition of CNs from *Miscanthus* and the synthetic cellulose at 199 °C and 200 °C, respectively, as well as high specific heats of decomposition at 8.43 kJ/g and 7.74 kJ/g, respectively. Conclusions: the obtained findings corroborate that the new raw sources can be used as a precursor for high-demand cellulose nitrates.

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