ADSORPTION OF POLYETHYLENE GLYCOL ONTO CELLULOSE NANOCRYSTALS SURFACE TO REDUCE HYDROPHILICITY

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Cellulose nanocrystals (CNC) can be produced by acid hydrolysis from various cellulose sources. This material has a great potential for application due to its properties, as renewability, high aspect ratio, low density among others [1]. When used as reinforcement in hydrophobic matrices, CNC tend to agglomerate and the interfacial adhesion is poor [2]. In this work, an alternative procedure to reduce CNC hydrophilicity is presented. Polyethylene glycol (PEG) was adsorbed onto its surface in order to improve compatibility with hydrophobic matrices. CNC and PEG were mixed (4 wt% PEG) in deionized water and allowed to stir for 3 hours at room temperature. The sample was then frozen and lyophilized. The resulting CNC-PEG was characterized by atomic force microscopy (AFM), zeta potential, infrared spectroscopy (FTIR) and thermogravimetry (TGA). CNC and CNC-PEG were previously dispersed in water to obtain AFM images, which showed that CNC-PEG had a tendency to agglomerate. Zeta potential increased from -45.0 mV to -26.7 mV. Both AFM and zeta confirm the reduction in polarity/hydrophilicity. Adsorption of PEG to the CNC surface could not be confirmed by FTIR, in spite of the increase in some absorption bands intensity, in the region between 1350 and 1110 cm^{-1}. TGA showed that the degradation process for CNC-PEG happens in two stages. The first peak is related to cellulose degradation, while the second one is related to PEG thermal degradation. This result confirms that PEG was successfully adsorbed onto CNC surface.

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