

CHARACTERIZATION OF CELLULOSE NANOWHISKERS SEPARATED FROM INDUSTRIAL BIORESIDUES AND MICROCRYSTALLINE CELLULOSE

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The fact of cellulose been the structural component of the primary cell wall of green plants and some algae, makes it one of the most abundant and naturally occurring polymers on earth. However, cellulose nanowhiskers (CNW) are not commercially available till date. CNWs are rod-like shaped nano-sized crystals that can be obtained from different natural resources.

Recently there is an interest to use bioresidues to isolate CNWs to provide value-add to the natural resources and help the economy of the companies. Our earlier studies have shown that it's possible to extract CNW from industrial bioresidues [1].

In order to determine if these industrial bioresidues are an option for the production of CNW, the characteristics of nanowhiskers extracted from bioethanol residue (ER), by homogenization, and sludge (SL) from cellulose production, extracted by sulfuric acid hydrolysis, were compared with CNW extracted from commercial microcrystalline cellulose (MCC) by sulfuric acid hydrolysis. The schematic representation of the isolation route adopted for the studied materials are given in Figure 1.

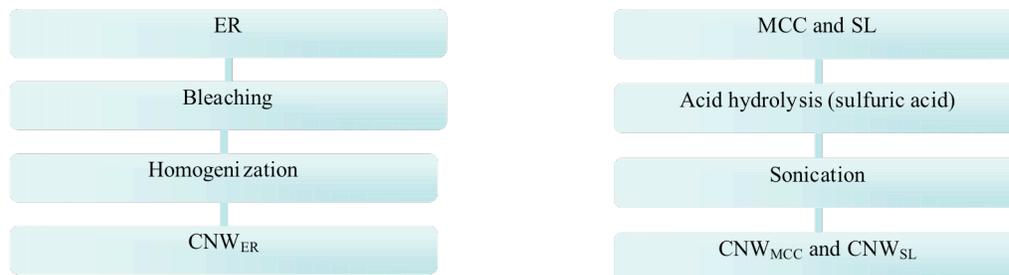


Figure 1: Scheme for the CNW extraction from the sources used.

The flow birefringence of aqueous suspensions of the CNWs were analyzed through a set of cross polarized filters and a lamp, to understand if the nanocrystals are isolated. The morphology of the whiskers was analyzed with an atomic force microscope (AFM) in tapping mode, on a drop of CNW solution dried over freshly cleaved mica sheet.

Films from each suspension were prepared by solution casting to obtain films of $\approx 40 \mu\text{m}$ of thickness. On these films, the UV/Vis spectroscopy, X-ray diffraction and thermal analysis (TGA) were studied.

The results showed that these bioresidues are possible sources for the production of CNW.

Acknowledgments

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Reference

1. Oksman K. Cellulose nanowhiskers separated from a bio-residue from wood bioethanol production. *Biomass Bioenergy* 2011;35(1):146-52.