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Synthesis of nanocrystalline cellulose from plant and their chromatographic applications

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Researchers are exploring green synthesis methods for producing nanocrystalline cellulose (NCC) due to environmental concerns and economic constraints. In this study, NCC was synthesized in a cost-effective method using an abundant invasive plant material called Guinea grass (Panicum maximum). In this study, cellulose extraction, purification through alkaline treatment and bleaching, cost-effective acid hydrolysis using 5% sulfuric acid and 10% acetic acid, and a comparison of two drying methods (freeze-drying and oven drying) were investigated to produce NCC. The characterization of the NCC was carried out by Fourier Transfer Infrared Spectroscopy & X-Ray Diffraction. The crystallinity index was slightly higher in Oven dried Cellulose Nanocrystals (OD CNCs) (18.60 %) compared to freeze dried (FD) CNCs (18.22%). Additionally, when examining crystallite size, OD CNCs exhibited a smaller crystal size (76.08 nm) compared to FD CNCs (118.12 nm). Using FD CNCs, chromatographic paper was produced, and OD CNCs were used to make Thin Layer Chromatographic (TLC) plates. Both the paper and TLC plates exhibited comparable Rf values and were more time-efficient when compared to conventional chromatographic paper and TLC plates. This study implies a cost-effective method to synthesize CNCs using abundant plant waste. The application of CNCs in chromatography indicates their potential to replace traditional methods in the future.

Key words: Nanocrystalline cellulose, Oven dried Cellulose nanocrystals, Freeze dried Cellulose nanocrystals, Thin layer chromatography

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