The valorization of municipal grass waste for the extraction of cellulose nanocrystals

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Abstract

The study reports on the valorization of municipal grass waste (MGW) for the extraction of cellulose nanocrystals (CNCs), as an eco-friendly and sustainable low-cost precursor for cellulose nanomaterial production. The raw MGW was subjected to boiling in water pretreatment, and alkali and bleaching treatments for the extraction of cellulose fibers, followed by isolation of the CNCs through a conventional acid hydrolysis technique. Fourier transform infrared spectroscopy was used to analyze the cellulose fibers extracted while scanning electron microscopy and transmission electron microscopy images confirmed the presence of cellulose fibers and CNCs, respectively. The chemical composition of MGW was ascertained through the TAPPI-222 om-02 standard for lignin content and determination of alpha-cellulose. The diameters of CNCs are in the range of 5-15 nm with the length ranging from 100 nm to 500 nm, while a crystallinity index of 58.2% was determined from X-ray diffraction analysis. The production of CNCs from MGW is an avenue to convert green waste into a value-added product, in addition to reducing the volume of cumulative waste in the environment.

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Keywords Plus: FIBERS; NANOCELLULOSE; NANOCOMPOSITES; NANOFIBERS; MEMBRANES; PROGRESS; FACILE

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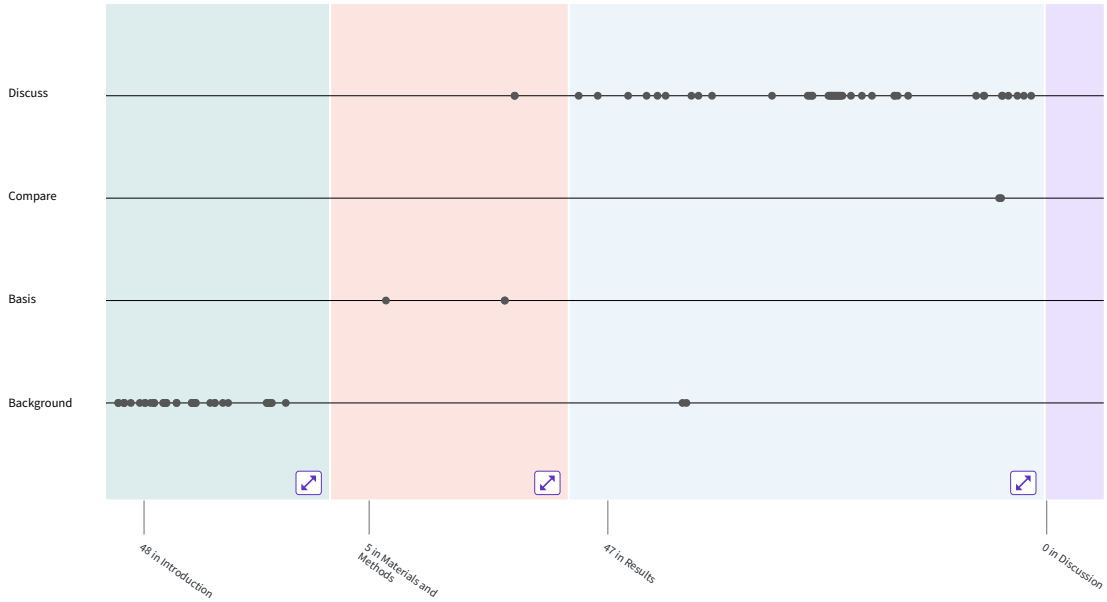

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