

A simple approach to prepare carboxycellulose nanofibers from untreated biomass and its applications

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A simple approach was developed to prepare carboxycellulose nanofibers directly from untreated biomass using nitric acid or nitric acid-sodium nitrite mixtures. Experiments indicated that this approach greatly reduced the need for multi-chemicals, and offered significant benefits in lowering the consumption of water and electric energy, when compared with conventional multiple-step processes at bench scale (e.g., TEMPO oxidation). Additionally, the effluent produced by this approach could be efficaciously neutralized using base to produce nitrogen-rich salts as fertilizers. TEM measurements of resulting nanofibers from different biomasses, possessed dimensions in the range of 190-370 and 4-5 nm, having PDI=0.29-0.38. These nanofibers exhibited lower crystallinity than untreated jute fibers as determined by TEM diffraction, WAXD and 13C

CPMAS NMR (e.g., WAXD crystallinity index was <35% for nanofibers vs. 62% for jute). Nanofibers with low crystallinity were found to be effective for removal of heavy metal ions for drinking water purification.

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