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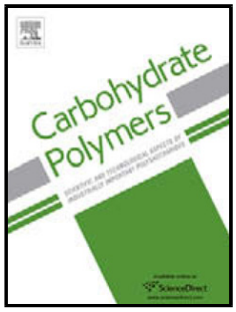

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Authors: Jin Gu, Chuanshuang Hu, Rui Zhong, Dengyun Tu, Hong Yun, Weiwei Zhang, Shao-Yuan Leu

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<AT>Isolation of cellulose nanocrystals from medium density fiberboards

<AU>Jin Gu[a], Chuanshuang Hu[a,*] ##Email##cshu@scau.edu.cn##/Email##, Rui Zhong[a], Dengyun Tu[a], Hong Yun[a], Weiwei Zhang[a], Shao-Yuan Leu[b]
<AU>
<AFF>[a]College of Materials and Energy, South China Agricultural University, Guangzhou, P.R of China, 510642
<AFF>[b]Dept. Civil Environ. Eng., Hong Kong Polytechnic University, Kowloon, Hong Kong

<PA>Tel.: +86 13719337676; Fax: +86 2085281885.

<ABS-HEAD>Highlights► Cellulose fibers were isolated from medium density fiberboards (MDFs) by acidified $NaClO_2$/KOH process. ► Cellulose nanocrystals (CNCs) were prepared from MDF cellulose fibers via sulfuric acid hydrolysis. ► MDF CNCs were highly crystalline (59%) and thermal stable similar to eucalyptus CNCs. ► Urea-formaldehyde resin in MDF affected the isolation process and contributed to CNC properties.

<ABS-HEAD>Abstract

<ABS-P>Cellulose fibers have been successfully isolated from medium density fiberboards (MDFs) by sodium chlorite oxidation-potassium hydroxide ($NaClO_2$-KOH) leaching process, at 37.6% yield, comparable to the 39.3% and 37.3% cellulose fiber from eucalyptus and eucalyptus with 12% cured urea-formaldehyde (UF) resin, respectively. At the same sulfuric acid hydrolysis conditions (65% H_2SO_4, 60°C and 30 min), MDF cellulose nanocrystals (CNCs) were produced at 27.5% yield, similar to 27.4% of CNC yield from eucalyptus with UF resin, but less than 31.2% yield from eucalyptus. MDF CNCs were slightly thicker in lateral dimension (16.8±8.6 nm), less crystalline (59% CrI), and surface esterificated (0.045 mmol/g sulfate/CNC) than eucalyptus CNCs (11.6±3.9 nm, 75% CrI, 0.060 mmol/g) and CNCs from eucalyptus with UF resin (14.9±9.1 nm, 65% CrI, 0.046 mmol/g). All CNCs were free of UF resin and thermal stable. The residual resin in cellulose pulps hydrolyzed completely during the sulfuric acid treatment and contributed to the unique properties of CNCs. Therefore, CNCs derived from MDF are comparable to CNC from wood and promising for expanded applications.

<KWD>Keywords: Cellulose nanocrystals; sulfuric acid hydrolysis; medium density fiberboard; cellulose fiber isolation

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