

Supporting information

Preparation of nanocellulose by biological method from hemp stalk contrast chemical method and its application on the electrospun composite film

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In terms of chemical reagent dosage and reaction time, comparing CNFs and CNCs prepared by the biological and chemical from similar raw materials in Table S1. The prepared CNFs are hydrophobic by our reported new method with unique advantages on the amount of chemical reagents and reacted time. It showed that this eco-friendly preparation solves the problems of low yield, hydrophilicity and chemical strong acid pollution.

The extraction rate of the CNFs (44.7%) provided by biological in this paper is significantly higher than that CNCs (24.6%) and others (22.2%) provided by the chemical method, and is slightly higher than that CNFs (41.0%) prepared by other enzymatic methods. This is because the biological method of the invention can selectively degrade lignin and hemicellulose, and relatively completely separate cellulose, with little damage to cellulose, and thus increased their extraction rate.

Table S1 Extracted methods, and properties of CNFs and CNCs

Method	Bleaching treatment	Preparation	Propertie	Extractio n rate	Ref.
This biological method (CNFs)	5% NaClO ₂ and 0.8 % acetic acid at 80 °C for 4 h.	1.5% Pectin lyase, 1.5% chemical auxiliaries at 80 °C for 4 h.	Hydrophobicity and lipophilicity	44.7%	This study
The other biological method (CNFs)	1.3 wt% NaClO ₂ , with mass ratio of 1:80 of sugarcane bagasse, at 65 °C for 2h; 2% KOH with the mass ratio of 1:80 of sugarcane bagasse, at 85 °C for 4 h.	1 mg a combination of ThCel7B, TcXyn10A and TtLPMO9H enzyme with the mass ratio of 1:15, at 50 °C for 24 h.	Hydrophily and lipophilicity	41.0%	[01]
This chemical method (CNCs)	5% NaClO ₂ and 0.8% mL acetic acid at 80 °C for 4 h.	54% H ₂ SO ₄ aqueous solution with mass ratio of 1:10 were boiled at 40 °C for 4 h	Hydrophily and lipophilicity	24.6%	This study
The other chemical method (CNCs)	10.8 g NaClO ₂ , 9 mL acetic acid per g of red algae, at 75 °C for 1.5 h; 2.7 mL H ₂ O ₂ per g of red algae, at 80 °C for 1.5 h.	54% H ₂ SO ₄ per g of cellulose, at 30 °C for 1.5 h.	Hydrophily and lipophilicity	22.2%	[02]

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02 Liu, Z.; Li, X.; Wei, X.; Deng, H. Extraction, isolation and characterization of nanocrystalline cellulose from industrial kelp (*laminaria japonica*) waste. *Carbohydr. Polym.*, 2017, 173, 353-359. <https://doi.org/10.1016/j.carbpol.2017.05.079>.