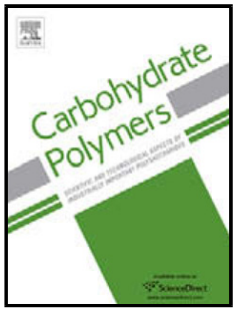

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Isolation and characterization of Cellulose nanofibrils from Colombian Fique decortication by-products

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Highlights

1. Cellulose nanobribrils (CNF) from Fique tow were extracted using TEMPO
2. Ultrasound-assisted TEMPO greatly influence DO and colloidal stability of CNF.
3. Fique CNF exhibit similar properties to CNF from different biomass sources.

Abstract

Fique fibers are extracted from *Furcraea spp* leaves, with 5% average mass yield, using mechanical decortication. Juice, pulp and tow, the by-products of this process, amount 95% of the leaf weight and are considered waste. We extracted cellulose nanofibrils (CNF) from Fique tow, via ultrasound-assisted TEMPO followed by mechanical disintegration with sonication. Fique CNF exhibit diameters around 100 nm, degree of oxidation (DO) of 0.27 and surface charge density (σ) of 1.6 mmol/g. Fique CNF aqueous suspensions show optical birefringence and high colloidal stability due to a high ζ potential (–53 mV). The morphology, chemical structure, crystallinity and phase transitions of Fique CNF were studied using FESEM, IR-ATR, XRD and TGA. We observed that the delignification pretreatment and the TEMPO reaction assisted by ultrasound significantly increase Fique CNF σ and ζ potential, in contrast with the oxidation carried out without ultrasound or with raw (lignified) tow.

Keywords

Natural fibers; Fique fibers; Fique tow; cellulose nanofibrils (CNF); ultrasound-assisted TEMPO.

1. Introduction

Socio-economic and climate change issues are compelling governments and companies to promote sustainable growth based on transformation of low-cost and renewable resources (García et al. 2016). Agro-industrial residues, widely distributed, abundant and biodegradable may play an important role in a sustainable future