Journal of Polymers and the Environment
https://doi.org/10.1007/s10924-020-01974-7

ORIGINAL PAPER

Dispersibility and Stability Studies of Cellulose Nanofibers: Implications for Nanocomposite Preparation

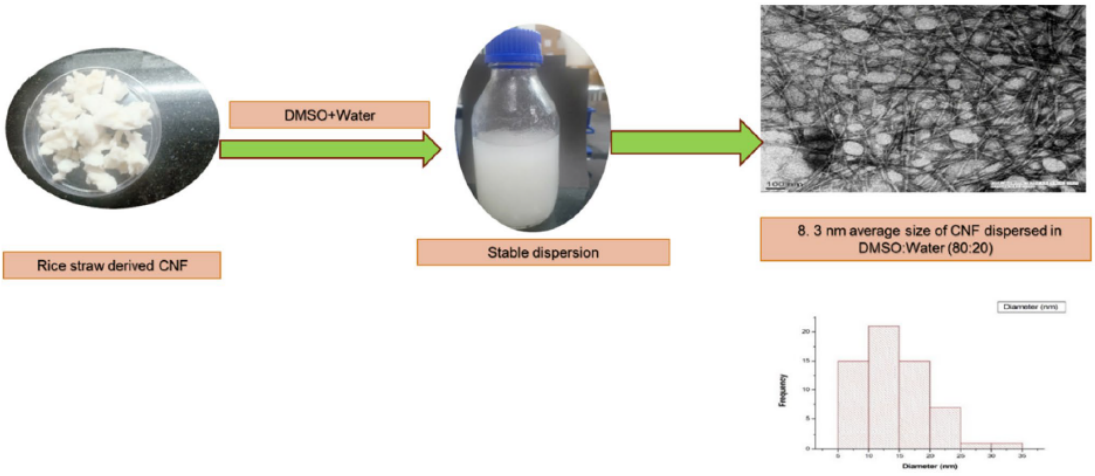
Amita Sharma[1,2] · Tamal Mandal[2] · Saswata Goswami[1]

Accepted: 11 November 2020

Abstract

Physical properties of nanocomposites has been enhanced by achieving stable CNF suspension in organic solvent without the use of surfactants or large energy input. In this study, after freeze drying rice straw (RS) derived CNF has been successfully dispersed in solvents including DMSO dimethyl sulfoxide, H_2O and DMSO/H_2O. The concentration of CNF and solvent ratio was optimized and analyzed by high resolution transmission electron microscopy, HR-TEM and Zetasizer. It was found that average diameter of CNF is 8.3 nm in binary solvent mixture of DMSO/ H_2O (80:20), whereas in pure water (40.3 nm) under the same sonication treatment conditions. Zeta potential value was reduced from (− 55 mV) in pure water to (− 45 mV) in DMSO/Water mixture showing better stability and it was also verified by sedimentation studies. Around 70% transparency of CNF was achieved in co-solvent mixture that can be utilized for nancomposite film fabrication. The fact that CNF can be well dispersed in organic solvents opens up new opportunities for blending of CNF—polymer matrix in coating and packaging applications.

Graphic Abstract



Keywords Rice straw · Cellulose nanofibers · Dispersibility · Freeze drying · Transmittance

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s10924-020-01974-7) contains supplementary material, which is available to authorized users.

Extended author information available on the last page of the article

Published online: 22 November 2020