

Accepted Manuscript

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PII: S0144-8617(18)30373-4
DOI: <https://doi.org/10.1016/j.carbpol.2018.04.005>
Reference: CARP 13459

To appear in:

Received date: 9-1-2018
Revised date: 14-3-2018
Accepted date: 1-4-2018

Please cite this article as: Felfel, Reda M., Hossain, Kazi M Zakir., Kabir, Sumaya F., Yee, Soon L., Ahmed, Ifty., & Grant, David M., Flexible and transparent films produced from cellulose nanowhisiker reinforced agarose. *Carbohydrate Polymers* <https://doi.org/10.1016/j.carbpol.2018.04.005>

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Flexible and transparent films produced from cellulose nanowhisker reinforced agarose

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Research Highlights

- Never-dried CNWs and Agarose were utilised to produce transparent and flexible nanocomposite films.
- The nanocomposites films maintained more than 84% optical transparency.
- The crystallinity of the nanocomposite films increased with the addition of CNWs.
- A significant increase in mechanical and thermomechanical properties of the nanocomposites was obtained.
- Incorporation of CNWs led to reduction in the swelling rate of the nanocomposite.

Abstract

Transparent and flexible nanocomposite films with a range of Agarose to Cellulose Nano-Whisker (CNW) ratios were produced using never-dried CNWs. The incorporation of never-dried CNWs within Agarose played an important role in the surface roughness (Ra 7 to 15 nm) and light transparency of the films (from 84 to 90%). Surface induced crystallisation of Agarose by CNWs was also found with increasing percentage of crystallinity (up to 79%) for the nanocomposite films, where CNW acted as nucleating sites. The enhanced tensile strength (*ca.* 30% increase) and modulus (*ca.* 90% increase) properties of the nanocomposite

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