

Current Research on Cellulose Nanocrystals (CNC) as Reinforcing Materials in Bio-Nanocomposites

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Abstract

Cellulose nanocrystals (CNC) has unique properties which are different from the properties of cellulose at the macro scale, in addition to having all the biodegradable attributes associated with its plant-based source. CNC is a promising renewable biomaterial in many different applications, such as in biocomposites, pharmaceuticals, food packaging, etc. By using CNC, outstanding properties, or significantly improved physical, chemical, can be developed. Since the last six years, we have been extensively working on CNC from different types of Malaysian resources natural fibres such as kenaf, rice husk, coconut, empty fruit bunch, mengkuang and nata de coco. Aqueous suspensions of such nanocrystals can be prepared by acid hydrolysis of the substrate. Starch biocomposites reinforced by cellulose nanocrystals through the solution casting technique were successfully fabricated. The starch biocomposite films reinforced with nanocrystals showed an improvement in tensile strength and modulus. Field emission scanning electron microscopy (FESEM) showed that CNC were well distributed in the matrix. Hydrogels with remarkable sensitivity toward changes in pH are also prepared using gelatin and poly(acrylic acid) reinforced with CNC. The finding have shown the ability of the CNC hydrogels to respond to different pH values along with its high mechanical stability suggested that CNC hydrogels are promising candidates as drug carriers. This paper provides potential application of CNC with improving properties.