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## Morphological characteristics and thermal, rheological, and mechanical properties of cellulose nanocrystals-containing biodegradable poly(lactic acid)/poly( $\epsilon$ -caprolactone) blend composites

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### Abstract

This work investigates the effect of cellulose nanocrystal (CN) loading on the properties of polylactide/poly( $\epsilon$ -caprolactone)(PLA/PCL) (70/30) blend processed in a twin-screw extruder as a potential material that can be utilized in various applications where biodegradation is highly desired. The morphological analysis revealed a reduction in droplet size of dispersed PCL phase upon addition of CN at low concentrations (1 and 2 wt %) with maximum reduction at 2 wt % which led to maximum improvement in mechanical properties. The reinforcing effect of CN in increasing the DMA storage modulus of the prepared systems was noticed when CN concentration was increased. Further, CN enhanced the crystallization of PCL, whereas the cold crystallization of PLA remained the same with CN addition. Both melt strength and viscosity of PLA improved with the incorporation of PCL and CN. In general, a green composite material with improved properties was successfully prepared using an environmentally friendly filler material.