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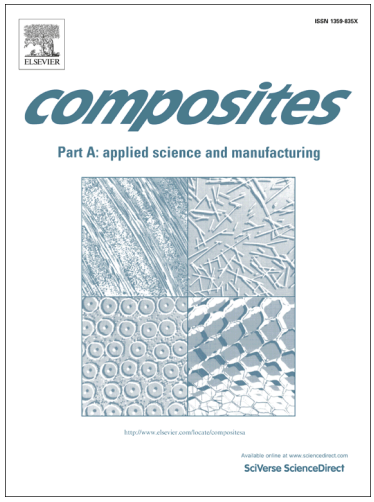

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Structural and mechanical properties of cellulose composites made of isolated cellulose nanofibers and poly(vinyl alcohol)

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Abstract

A composite of cellulose-nanofibers (Cel-F)/polyvinyl alcohol (PVA) was made through a developed water-jet nano-isolation process called the Star Burst processing (SB). The structural and the mechanical properties of the pure Cel-F and the Cel-F/PVA composites were analyzed for comparison. The microstructural analyses revealed the step-by-step nano-isolation procedures of the SB processing, eventually constructing nanofibers with the minimum diameter of ~23 nm. It was also found that the crystallinity of Cel-F was rapidly increased by 14% at the early stage of the SB process, subsequently becoming almost constant, irrespective of the number of the SB treatments. Additionally, Cel-F were homogenously dispersed in PVA matrix after 40 SB treatments. The Young's modulus of the resulting composite was increased by 48%. The results were in good agreement with the outcome of the short-fiber

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