Natural Fibre Reinforced Cellulose Nanocomposites

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The design, optimisation and control of composite interfaces is the most crucial issue in composite engineering and more so in green composites, because of the known incompatibility of the reinforcing fibres and many polymers used as matrix. Here we will present a novel route to design the interfaces in natural plant fibre reinforced biobased polymers. Nano-scale bacterial cellulose fibre was successfully grafted onto hemp and sisal surface by a strain of cellulose-producing bacteria, Gluconacetobacter *xylinus* strain BPR 2001, without any apparent degradation to the fibre tensile properties. Scanning electron microscopy (SEM) showed the good grafting on both fibres which has roughened the surface. Hemp surface before and after the grafting procedure are showed in Figure 1 and Figure 2 respectively. Single fibre pullout tests have proved that our technique can increase the interfacial shear strength (IFSS) between the plant fibres and the biodegradable cellulose acetate butyrate polymer (CAB) by up to 200%. The process is purely green and allows for the production of fully renewable fibre reinforced cellulose nanocomposites.

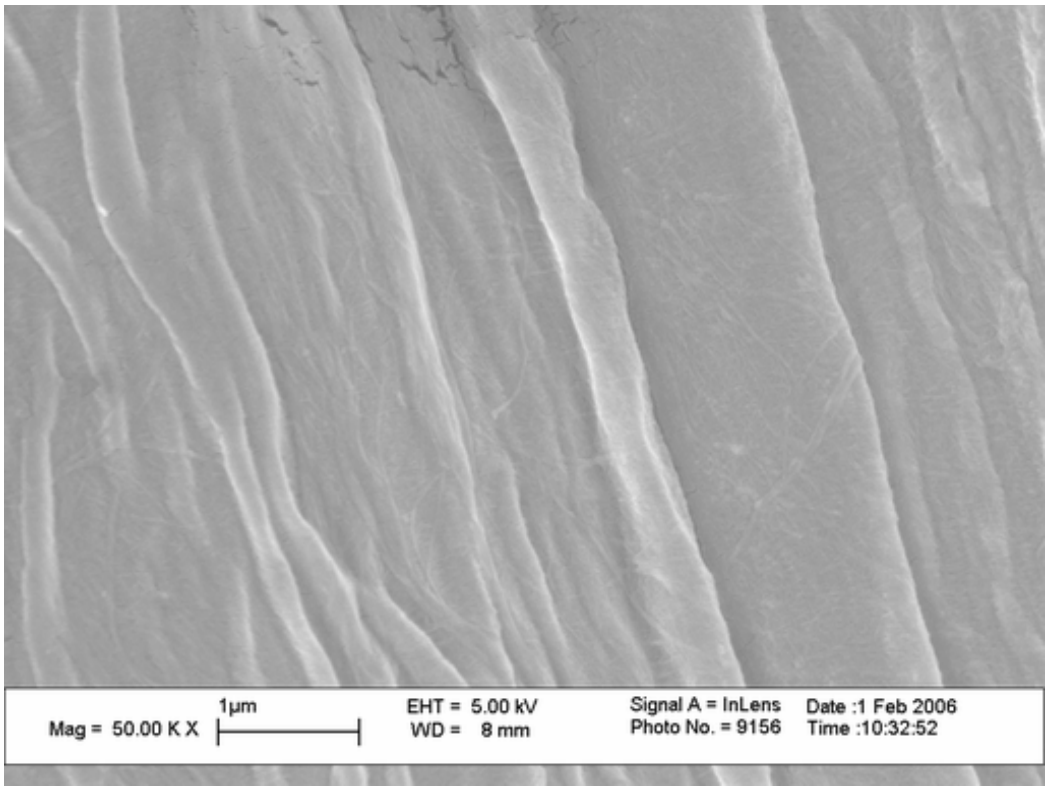

Figure 1 Scanning electron microscopy of hemp fibre

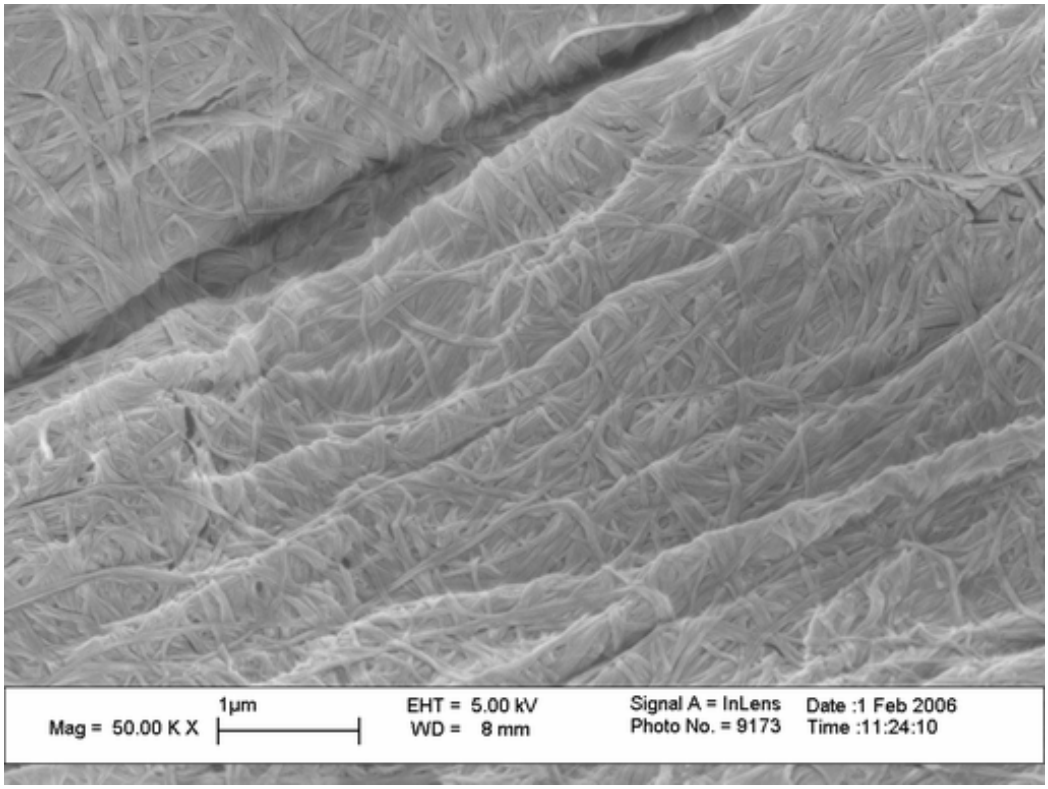

Figure 2 Scanning electron microscopy of hemp fibre after bacterial cellulose grafting