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## Bio-inspired consolidants derived from crystalline nanocellulose for decayed wood

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### Highlights

- New CNC-based consolidants for decayed wood have been prepared
- The consolidant efficiency of CNC has been confirmed on old rotted wood
- On the highest decayed wood classes, the CNC treatments show the best performance

### Abstract

Novel bio-inspired materials derived from crystalline nanocellulose (CNC) have been tested as wood consolidants. A suspension of CNC, produced by acid hydrolysis of cellulose and used as such or mixed with lignin and/or siloxane derivatives (PDMS), was applied on rotted wood samples of Norway spruce. X-Ray diffraction analysis on CNC powder showed high crystallinity index. Dynamic light scattering (DLS) measurement indicated a nearly uniform particle size distribution with an average hydrodynamic diameter for pure CNC smaller than that in the mixtures. Raman and FTIR spectroscopies suggested interactions between lignin, PDMS and CNC components. The storage modulus of wood samples, measured by Dynamic Mechanical Analysis on the same specimen before and after consolidation, confirmed the efficiency of pure CNC, which displayed a considerable improvement of stiffness. A substantial increase of  $E'$  was observed particularly for most decayed classes. These results suggest a closer interaction between nanocellulose and decayed wood.

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