ForestValue
StrongComposite

Delignified Wood-Gelatin Composites

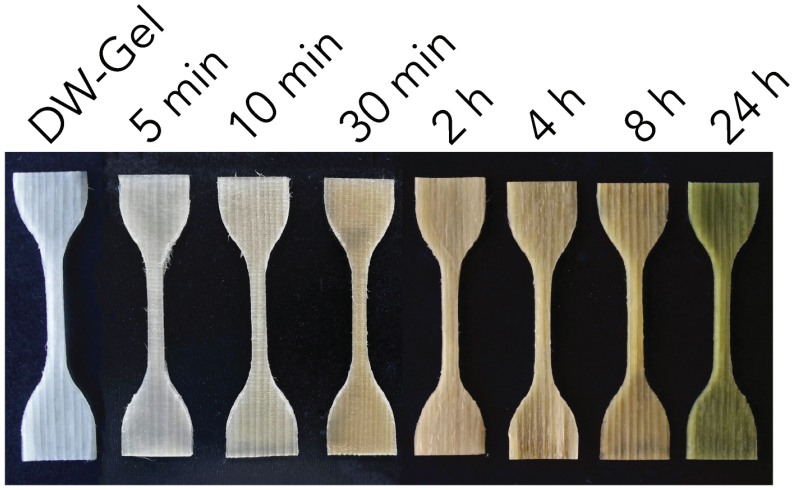

Figure 1. Delignified wood-gelatin composites crosslinked for different times.

Soft, entirely bio-based and biodegradable composites with anisotropic structure

Cellulose has been widely applied as a reinforcing phase in soft and flexible materials, e.g., in the form of cellulose microfibrils or nanocrystals. A remaining difficulty is the orientation of these small fibrous materials for anisotropic materials, particularly on a larger scale. Structure-retaining delignification of wood is a promising alternative to directly transfer the hierarchical, anisotropic, and porous structure of the wood to soft and flexible matrices instead of using tedious bottom-up assembly processes. In this research, we delignified spruce veneers and infiltrated them with an aqueous gelatin solution. In the next step, the gelatin-infiltrated samples were chemically crosslinked for different durations. During the crosslinking, the color of the composites changed from white to yellow to green (**Fig. 1**) and became increasingly rigid and strong. The gelatin-filled lumen of the delignified wood became stiffer with a more extended crosslinking time, as shown by atomic force microscopy mappings in **Fig. 2**. The tailorable mechanical properties, as well as the highly anisotropic structure, render these bio-based composites an interesting candidate for applications in the biomedical or soft robotics field.

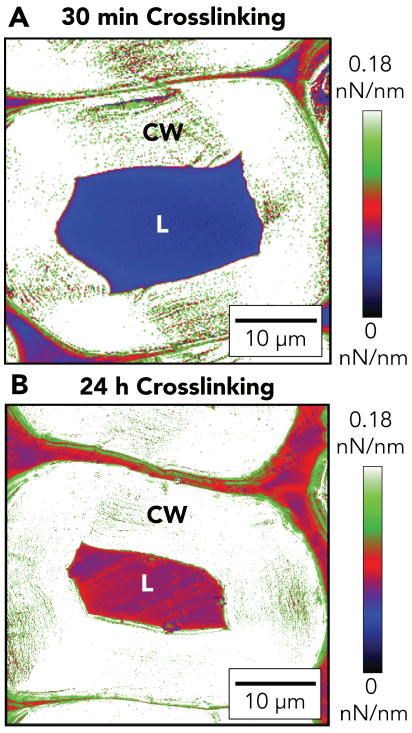

Figure 2. Atomic force microscopy force mappings of (**A**) 30 min and (**B**) 24h crosslinked delignified wood-gelatin lumina. L = Lumen, CW = Cell Wall

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