

A Novel Material Concept for High Strength Cellulose Composites (StrongComposite)



We will use cellulose in a new way to produce sustainable materials. By using cellulose in more versatile and better ways we will be able to reduce dependence on fossil raw materials. In our project we use wood that we treat chemically so that only the strong cellulose fibers remain. This delignified form still has the orientation of the cellulose chains in the same way as in the original wood which gives very good mechanical properties. The challenge in our project is to introduce new types of adhesives into the delignified wood, and then press it into new shapes. We are studying different types of natural adhesives for the gluing. The challenge is to get the glue into the wood structure without destroying its structure. In the project several different partners try out different types of approaches. One solution is to use proteins that have strong binding and cross-linking properties. Proteins have the advantage that they are water soluble and therefore show a very good penetration into the structures. These adhesives are tested by the mechanical strength of adhesive joint. So far we have succeeded in making adhesives using proteins that show very good properties, and we continue to study the mechanics of fracture to understand the best way of producing this type of new, biologically produced and sustainable high performance material.



Photo: Fracture of an adhesive joint made by protein based glues. By analyzing the fracture mechanics we can understand and improve adhesives. Photo Laura Lemetti.

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