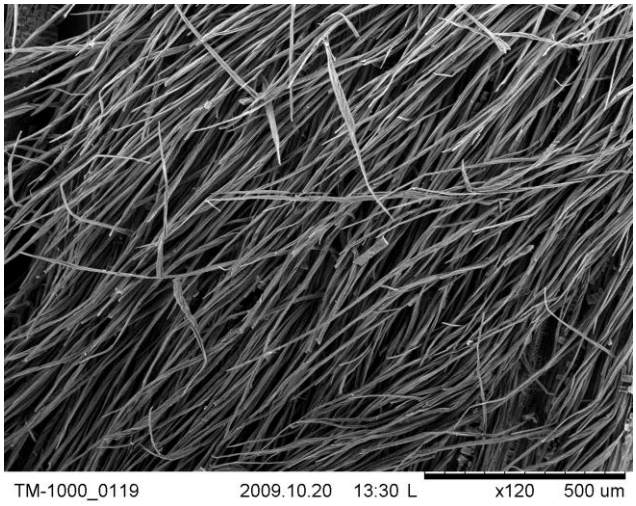
Development of a natural UV-protection of wood surfaces by cellulose-rich layers



The idea of the project is to set up a natural cellulose based UV-protection layer on top of wood surfaces by a prior removal of lignin, the wood component most sensitive to photodegradation, followed by a stabilization of the remaining structure.

Unprotected wood as organic material gets photo-chemically degraded during outdoor exposure which is one of the draw backs of wood in comparison to other materials. In the composition of wood, lignin is one of the most light sensitive substances. The idea of the proposed project is to set up a cellulose based UV-protection layer to create a natural UV-shield in order to prevent an inhomogeneous discoloration and surface degradation during outdoor applications. In a first step the lignin on the surface gets removed due to its oxidative sensitivity. This will be done by photo-chemical, pure chemical or enzymatic procedures. After the delignification a cellulose layer stays on the surface and interacts as a UV-protection shield. The lignin removal and the change of the surface properties will be characterized. The optical analysis will be done with different microscopic procedures (REM, AFM, Light microscopy). By using the FTIR spectroscopy the chemical changes in the surface gets controlled. And for a practical application the color change and roughness development will be measured as well. The second step of the treatment focuses on the stabilization of the surface. There are several options to fix the cellulose fibers and protect the surface for erosion. One possibility is the impregnation of the substrate with different agents to hydrophobize the surface and to increase the mechanical strength. The two steps treatment leads to a functionalized wood surface which is applicable to all wood products in outdoor use like facades, terrace boards, car ports and others.

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