ALINA LOZHECHNIKOVA

Aalto University, School of Chemical Technology

Department of Forest Products Technology

alina.lozhechnikova@aalto.fi

UNDERSTANDING THE INTERFACIAL PROPERTIES OF LIGNIN FOR HIGH PERFORMANCE MATERIALS

Lignin is nature's second most abundant polymer after cellulose. In the wood cell wall, lignin forms a matrix with hemicelluloses which surrounds the cellulose fibrils and it glues the fibres together. In pulping and other biorefinery processes, lignin is most commonly liberated from the fibres and then considered as a waste product used for energy production. However, lignin could be utilized as a valuable raw material for chemicals and materials.

The objective of this research is to gain fundamental knowledge about interactions of lignin with other biopolymers inside the wood cell, and to utilize this knowledge to create novel lignin-based adhesives and cellulose-lignin composites with excellent properties. The complex lignin – hemicellulose – cellulose interactions in the cell wall as well as the hierarchical structure of wood are the key reasons to the superior properties of wood. By understanding these interactions and mimicking them we can develop lignin based adhesives and composites that are sustainable, economically and technically feasible and have excellent mechanical properties. Main methods which will be used in this work are: Quartz Crystal Microbalance with Dissipation (QCM-D), Atomic Force Microscopy (AFM) and Colloidal Probe Technique to study surface forces and interactions.