

Simultaneous Chemical and Topographical Mapping of Wood Ultrastructures by Chemical Force Microscopy



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Idea

Wood structure is chemically modified to design functional bio-based materials



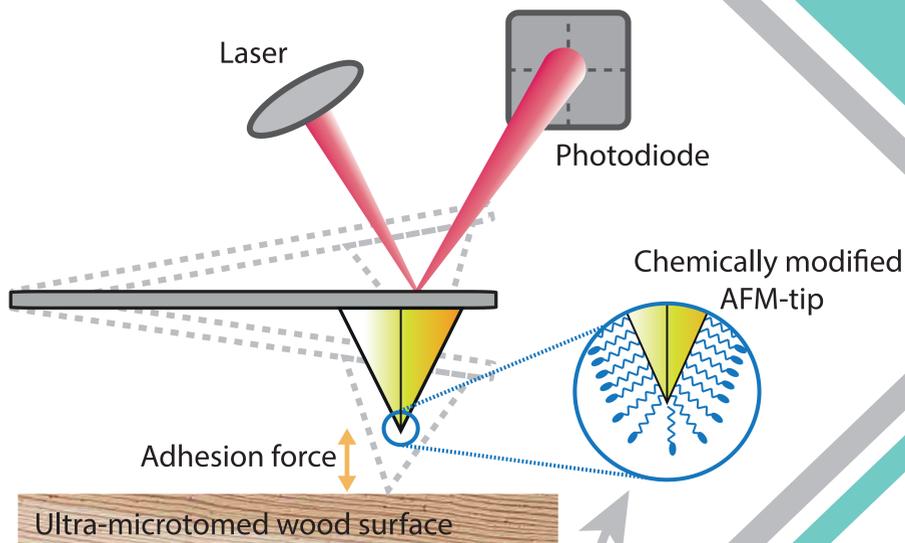
Challenge

Adjusted characterisation techniques to support the modification processes are required



Solution

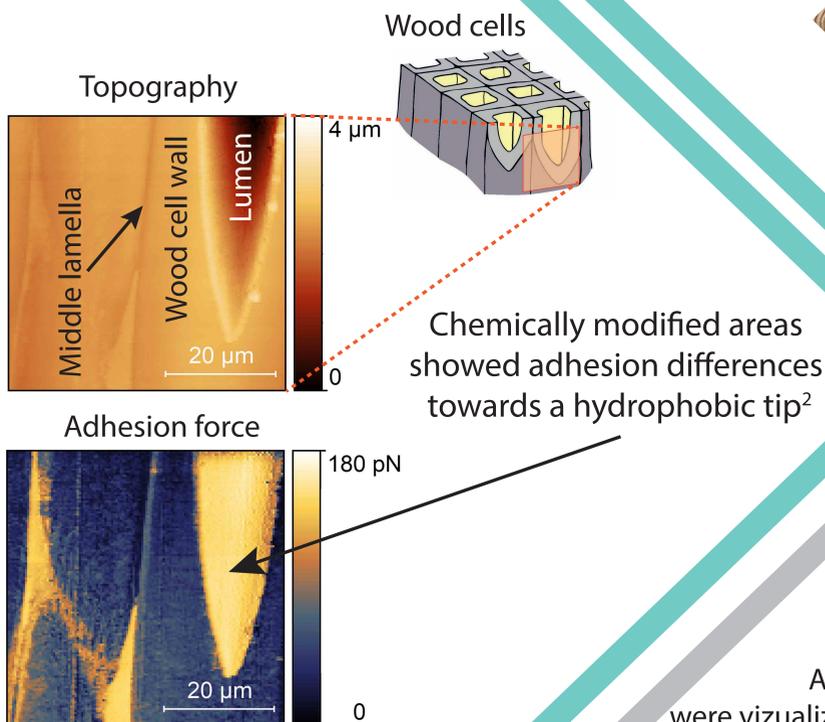
Chemical Force Microscopy



Principle

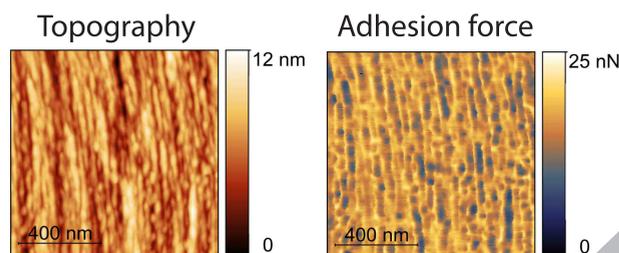
- Chemical Force Microscopy (CFM) is a variation of Atomic Force Microscopy (AFM)
- In this method, a tip with a radius of 10-100 nm is chemically modified with self-assembled monolayers
- The modified tip scans the sample and simultaneously performs force-distance measurements
- Topography and adhesion forces can be identified from the interaction of the tip and the surface of the sample by tracing the movement of the tip with a laser system
- These adhesion forces vary according to functional groups originating from the analysed surface, which allows to reveal their location¹

Results



Results

Adhesion changes were visualized of the fibrous secondary cell wall with high spatial resolution



→ Different magnitudes of adhesion forces indicate the distribution of functional groups

Literature:

1) Frisbie, C.D., et al., Science, 1994, 265(5181): p. 2071. DOI: 10.1126/science.265.5181.2071
2) Gusenbauer, C., et al., 2019, 9(1): p. 18569. DOI: 10.1038/s41598-019-54664-3