MWP

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Project title:

Nanoscale Mapping of Wood Cell Wall Polymers Using Nano-FTIR Spectroscopy

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Abstract (approx. 200 words):

Wood is one of the most abundant natural resources, yet our understanding of its structure is still mostly limited to the microscale. This limited knowledge holds back the full potential of wood-based materials in modern technologies. To develop more sustainable materials from wood, we must understand the structure and interactions within the wood cell wall at the nanoscale where its true complexity lies.

Understanding wood at the nanoscale has the potential to completely transform the forest-based industry by enabling smarter, more sustainable bio-based products. Our vision is to turn wood into a high-tech resource using advanced imaging and data-driven innovation.

Our research introduces the nanoscale chemical mapping of native wood cell wall polymers like cellulose, hemicellulose, and lignin at spatial resolutions of around 20 nanometres through nano-FTIR spectroscopy. By combining AFM topographic data with spatially resolved infrared spectra on the nanoscale, we have successfully identified cellulose-rich areas within the S2 layer, as well as hemicellulose. Studies of the nanoscale distribution of lignin are ongoing. Examples of applications are in studies of degraded wood and genetically modified wood.

Key words:
Wood Cell Walls; Nano-FTIR; Lignocellulosic; Wood Ultrastructure