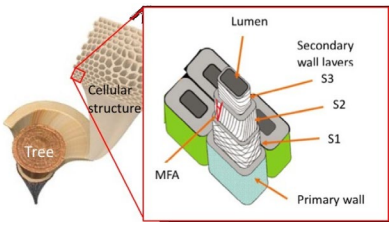
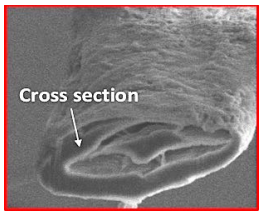
Master's thesis project:

Towards high-performance wood fibre reinforced composites: micromechanical testing on single wood fibres

Cellulose-based fibres, such as wood fibres, provide exciting opportunities for future sustainable reinforcements in polymer composites. One major challenge is wood fibres are highly hydrophilic (sensitive to humidity), implying poor compatibility with most polymers, which are hydrophobic. To address this issue, wood fibres are usually chemically or physically modified. The modification alters the properties of the fibres and the interface between fibre/polymer and the way they interact with various humidity levels, which must be tested and thoroughly understood.





In current research and development of wood fibre reinforced composites, macroscopic testing is predominant, studying the composite. Giving the large number of modifications, polymer systems, and processing parameters, the combinations for potential testing are myriad. More importantly, macroscopic testing is often unable to pinpoint the exact mechanisms behind certain behaviour, since many of the crucial characteristics can only be unambiguously measured on the single fibre level. Another important driver for single fibre testing is to facilitate simulation-based material design and property prediction.

However, there is still a lack of fundamental understanding on the *single wood fibre level*, and particularly a lack of experimental methodology that can efficiently address this challenge.

The aim of this master's thesis project is to develop a unique "micro-laboratory" for characterising properties of wood fibres and the interface between fibre/polymer, to support the development of better and more sustainable composite materials. The ultimate goal is to realize high throughput testing in an environmental chamber and in-situ testing inside an advanced electron microscope.

You should have a background in materials science, applied physics or similar. The project will run during January 2021 – June 2021, and provide 30 higher education credits. The work is performed at Chalmers, in close collaboration with other researchers in the All Wood Composite Platform.

To get more information or to apply, please email your application (cover letter and academic transcript) to Associate Professor Fang Liu, at the Department of Industrial and Materials Science: fang.liu@chalmers.se.