FAKULTÄT FÜR
BAU- UND UMWELTINGENIEURWESEN
INSTITUT FÜR MECHANIK DER
WERKSTOFFE UND STRUKTUREN

WoodComp3D

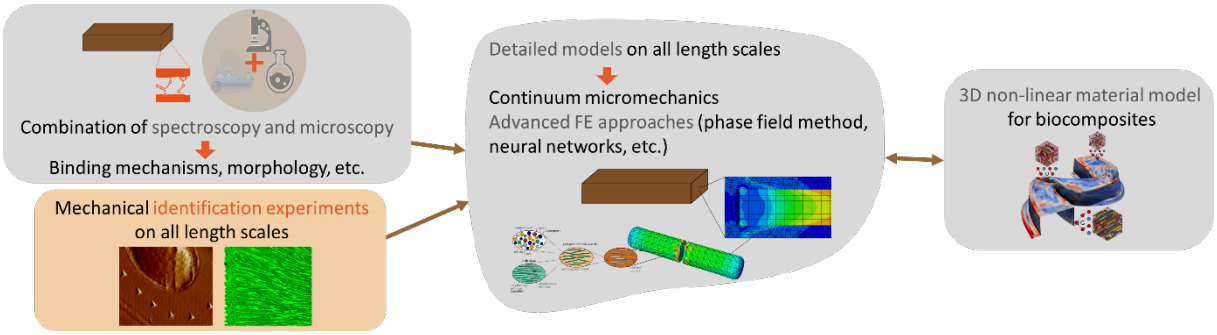
Master's Thesis

Mechanical identification experiments on wood-based biocomposites

The Christian Doppler Laboratory for Next-Generation Wood-Based Biocomposite (WoodComp3D) develops processes for producing and characterizing sustainable biocomposite materials based on sawmill by-products. Our goal is to create a biocomposite material using the main constituents of wood (wood fibers, lignin, extractives, etc.) with significant mechanical properties and, in parallel, a production and design concept for next-generation biocomposite elements.

In order to obtain the corresponding input parameters for such models, a wide variety of mechanical identification tests are required on a broad range of length scales. These tests range from nanoindentation tests of individual material phases at the nanometer level to micro-CT images of morphologies and single-fiber test setups at the micrometer to millimeter level and specially developed tests at the macro level to evaluate novel wood-based binders.

In this thesis, existing methods will be applied to obtain material properties of this new material on different length scales. In addition, methods will be further developed, e.g., using modern computer-aided evaluation methods, or new methods will be developed. The work will be embedded in an interdisciplinary team of civil engineers, process engineers, and chemists, building up the knowledge for such a new wood-based biocomposite material, both experimentally and by using simulation tools, to not only create a new material itself but also to develop material models for biocomposites. Such models can then be used to optimize the material and develop new types of biocomposite product designs.



This thesis will contribute to the mechanical identification of material properties of a new type of wood-based biocomposite (left), which, together with information from the interdisciplinary team of the CD laboratory, will be used as input parameters for advanced simulation approaches (middle) to develop detailed models on different length scales to obtain 3D non-linear material models for biocomposite materials (right).

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For more information on the CD laboratory, please see: https://woodcomp3d.at