

Background, motivation and aims of the thesis:

Sustainable materials, structures and their process technology are key enablers to address current challenges such as resource scarcity and the desire for circular economy concepts from an engineering point of view. Wood-based materials are highly interesting in this context, but there is currently still a lack of near-net-shape manufacturing processes that are competitive for new engineering applications. Here, additive manufacturing of lignin-based systems offers a vast potential with numerous advantages: Wood and the material systems derived from it are sustainable and, unlike most engineering bioplastics, do not add to the carbon footprint. However, wood is much more challenging from a process perspective than most engineering polymers, and the processing of additively manufactured substructures into macroscopically usable structures is currently lacking. In the context of this master thesis, the joining or better upscaling of 3D-printed lignin-based structures by means of modern ultrasonic welding technology will be studied. For this purpose, AM wood semi-finished products are first produced at the Chair of Forest Biomaterials, which are then welded to components at INATECH. Various welding systems are available for this purpose in terms of power demand, frequency range and kinematics. The successfully realized lignin structures are evaluated from a mechanical as well as microscopic point of view to estimate the performance and achievable strength and stiffness. By the combination of AM for lignin-based systems and the energy as well as material efficient process technology of ultrasonic joining, we hope to make progress in the development of fully sustainable material systems. The master thesis is suitable for all courses of study related to engineering and materials science. Feel free to apply today!

Contact

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Application documents

Please send your relevant application documents in a PDF-file (cover letter, resume and transcript of records (Bachelor grades)) in an e-mail to Christine Höher at: efm@inatech.uni-freiburg.de

Begin: Summer Term 2022 by the latest

Duration: According to exam regulations, (6 months)

Master Courses: Sustainable Materials, Sustainable Systems Engineering

[Contact at INATECH and further details](#)

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