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S E M I N A R
on
Semiconductor Physics and Nanotechnology

Mo, 12.12.2022, 11:15 Uhr,

Seminar in person in the Physics lecture hall *or* via Zoom

"Exploring Brillouin light scattering of lignocellulosic fibers"

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Plants are built up by fibers which contribute to the structure and function of, f.e., the tree. In the case of lignocellulosic fibers as they exist in wood, the main components are cellulose, hemicellulose, and lignin. Cellulose is the most abundant biopolymer and its products such as paper, tissue, and paper board are a necessity for our daily life. With the biobased industrial sector gaining importance, the demand is going to increase further.

However, a lot of the influencing parameters on the final product's properties are unknown. Especially figuring out the interplay between the single fiber and the fiber network level is challenging. One reason is that single fibers are complicated to investigate. They exhibit a complex hierarchical structure and have anisotropic properties which depend on moisture content. Furthermore, the geometry of such fibers is making them difficult to handle, with a diameter of about 20-50 µm and a limited length of 2-5 mm. Tensile testing is the main technique to investigate single fiber behavior. Besides high scattering and the need for fixation on a sample holder, it yields only properties in one fiber direction. With atomic force microscopy, the testing of more fiber directions is possible, however, very tedious and error-prone [1].

Here, Brillouin spectroscopy comes into play as a technique which enables the measurement of the whole elastic stiffness tensor in a non-contact manner. Using laser light to probe phonons in different directions and assuming a crystal geometry like hexagonal for fibrous materials [2] enables the determination of the elastic constants. In this talk, first results of such investigations will be presented for different types of lignocellulosic fibers and comparisons to mechanical testing will be drawn.

References:

[1] C. Czibula, A. Brandberg et al, Sci. Rep., 11, 22411 (2021)

[2] K. Koski et al, Nat. Mat., 12, p262-267 (2013)

Zoom – Link:

https://zoom.us/j/96375934537?pwd=RTlKTWhSdzRHU211YTY1bGFxTUtpZz09

Meeting-ID: 963 7593 4537

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