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Hörsaal für Physik

“Humidity influence on the mechanical properties of cellulosic materials determined by AFM based nanoindentation”

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Cellulose is an abundant bio-polymer which is a component of many modern-day products. In some cases, such as packaging paper, a high tensile strength is needed. It is therefore fundamental to know how the always present humidity will affect the materials' mechanical properties.

Another point, where the interaction between water and cellulose plays an important role is papermaking itself. There, fiber-fiber bonds are formed in the wet state and dried consecutively to generate a tough and porous material. Thus, it is of special interest to investigate mechanical properties of cellulose fibers used in papermaking as a function of relative humidity and in the fully wet state. For this purpose, we chose atomic force microscopy (AFM) based nanoindentation because it combines the possibility to gently image the surface before performing actual nanoindentation.

The effect of humidity was investigated on industrial grade pulp fibers and viscose fibers. Also the swelling behavior of amorphous cellulose model films was characterized. The combination of topographical information with the mechanical properties yields useful and important information to understand the role water plays in cellulosic materials.