

## Paavo A. Penttilä

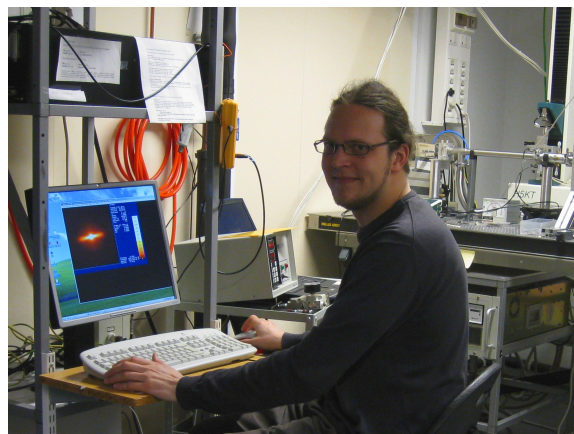
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I am doing my PhD work with the title "X-ray methods in characterization of bio-based polymeric materials" under the supervision of Prof. Ritva Serimaa at the University of Helsinki, Finland. My field of research is natural polymers, which I study mainly with small- and wide-angle x-ray scattering (SAXS and WAXS). In my work, I have been mostly concentrating on systems based on cellulose or starch, both consisting of highly abundant large natural polymers. The applications of my research vary from novel bio-based materials to renewable energy sources. My role is to characterize the structure of materials between the atomic scale and the continuum scale, thereby covering the lengthscale from Ångströms ( $10^{-10}$  m) to micrometers ( $10^{-6}$  m).

My current research problem is related to the enzymatic hydrolysis of cellulose in bio-fuels production. The degradation of cellulose by enzymes does not proceed efficiently enough for large scale utilization. My purpose is to study the limiting factors of the hydrolysis related to the substrate structure as well as the structural effects caused by the hydrolysis in the substrate material. Besides x-ray scattering methods, I have used x-ray microtomography, transmission electron microscopy (TEM) and dynamic FTIR spectroscopy in my work.

### *Selected publications:*

Penttilä, P. A., Suuronen, J., Kirjoranta, S., Peura, M., Jouppila, K., Serimaa, R., Tenkanen, M. (2011). X-ray characterization of starch-based solid foams. *Journal of Materials Science*, 46(10), 3470-3479.

Penttilä, P. A., Varnai, A., Leppänen, K., Peura, M., Kallonen, A., Jääskeläinen, P., Lucenius, J., Ruokolainen, J., Siika-aho, M., Viikari, L., Serimaa, R. (2010). Changes in sub-micrometer structure of enzymatically hydrolyzed microcrystalline cellulose. *Biomacromolecules*, 11(4), 1111-1117.