
MM 63: Invited Talk (Hauptvortrag) Paris

Time: Friday 9:30–10:00

Location: BAR 205

Invited Talk

MM 63.1 Fri 9:30 BAR 205

Water induced deformation of nanoporous materials —
•OSKAR PARIS — Institute of Physics, Montanuniversitaet Leoben,
Austria

The actuation of solid materials by water is ubiquitous in everyday life, ranging for instance from humidity driven movement of plants to frost damage in roads and buildings. In many - although by far not all - scenarios, the basic mechanisms are governed by the adsorption, condensation, or freezing of water within narrow, often nanoscale pores within the material.

We use nanoporous silica-based materials with cylindrical pores on highly ordered hexagonal pore lattices as model systems to assess the

material deformation quantitatively. The nanoscale deformation can be monitored in-situ by measuring the pore lattice strain with X-ray diffraction as a function of pressure or temperature. The basic mechanisms of deformation due to condensation or freezing of water in the nanopores can be well understood by fundamental thermodynamic principles [1], although many details are still a matter of debate.

Beyond the understanding of the underlying mechanisms, we deposit nanoporous thin films on non-porous thin substrates. By this, simple humidity-actuated micro-devices based on bilayer structures can be fabricated and their performance can be studied.

[1] M. Erko, D. Wallacher, and O. Paris: Deformation mechanism of nanoporous materials upon water freezing and melting. *Applied Physics Letters* 101 (2012), 181905.