

---

## **S E M I N A R**

aus

# **Halbleiterphysik und Nanotechnologie**

Di, 11.4.2017, 13:00 Uhr, Hörsaal für Physik

### **“Nanoscale characterisation of natural porous materials using high-resolution X-ray tomography”**

***Ass. Prof. Dr. Dirk Müter***

*(NanoGeoScience section, University of Copenhagen, Dänemark)*

X-ray tomographic imaging gives us the unique opportunity to 'see' into materials in 3D and determine material properties on scales down to the lower nanometre range. Combining tomography data with image analysis and computer simulations lets us access chemical and physical processes within natural systems such as ground water aquifers and derive parameter relations that can be scaled up and compared to macroscale experiments thus linking nanoscale interactions to field scale phenomena. I will present two examples for this approach, chalk and sea urchin shells. Chalk is an important aquifer and hydrocarbon reservoir rock in the North Sea region. It is formed from the remains of ancient algae and has retained many of the original features of the algae thus forming a complex nanoscale pore network. Using synchrotron based tomography and mesoscale simulations, I will demonstrate how to derive fluid flow and adsorption properties for this rock. Sea urchin shells appear macroscopically solid, but when studied with laboratory based X-ray tomography an intricate and highly porous network of struts somewhat reminiscent of human trabecular bone is revealed. Importing the tomography data into finite element simulations, I will show how to derive mechanical properties and discuss the material's potential for biotemplating, i.e. copying nature's design strategies to improve man-made materials.