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Einladung zum Vortrag

10. Januar 2014

von

Dr. Lukas Keller

ZURICH UNIVERSITY OF APPLIED SCIENCES, WINTERTHUR, SWITZERLAND

From 3D image acquisition and analysis to stochastic reconstruction of shale microstructures

Low-permeability geomaterials such as clay rocks and bentonites are potential seal materials that should guarantee the safety of radioactive waste depositories. In addition, such geomaterials are reservoirs of natural gas, which were increasingly exploited during recent years. Therefore, gas flow properties of such materials are of prime importance because, for example, gas pressure from corroding steel in radioactive waste depositories should be released via the intergranulare pore space. In any case, a final assessment of gas transport properties requires understanding of the microstructural control of gas transport.
In order to gain insights into shale microstructures we applied tomographic methods with different resolutions to Opalinus Clay. Regarding nano-scale porosity of shales, 3D information on the pore structure can be obtained either by tilt series from scanning transmission electron microscopy or from serial sectioning experiments with focused ion beam (FIB). In our case, resolution was in 2-20 nm range (i.e. voxel size) whereas the analyzable volume decreases with increasing resolution from about 1000 to 0.1 μm^3. Apart from visualization purposes, the reconstructed pore structures allow estimation of transport properties. For example, a fundamental issue regarding low-permeability rocks is the expected porosity (i.e. percolation threshold) at the onset of long-range percolation through the pore network. In order to predict the percolation threshold of shales classical percolation theory was applied to pore structures that were reconstructed on the base of FIB.
Relevant 3D geometric information of the pore space in shales can almost exclusively be obtained by using FIB, which is a time consuming and expensive method that is not suitable for exhausting analysis. As consequence it is planned to use the image data as input for the stochastic reconstruction of shale microstructures. The stochastic reconstruction of pore microstructures is attractive for couple of reasons. For example: 1) Successful microstructural modeling would provide the means to generate a wide range of virtual shale pore microstructures, which can be used as input to calculate physical properties. 2) The prediction of 3D shale microstructures on the base of 2D information, which would allow to analyze more samples.

Termin: **Dienstag, 28. Januar 2014, 9:00 Uhr**

Ort: **Universität Ulm, Helmholtzstr. 22, Raum E18**

Interessenten sind herzlich eingeladen.
Der Vortrag findet im Rahmen unseres Forschungsseminars statt.

gez. V. Schmidt