

**AN EXPERIMENTAL EXAMPLE OF CHEMICAL REACTION DRIVEN SOLUTION
TRANSFER CREEP**

S.W.J. den Brok (1), G. Melisa (2)

(1) Geologisches Institut ETH-Zürich, (2) Institut für Geowissenschaften, Universität Mainz.
denbrok@erdw.ethz.ch/Fax: +41-1-6323664

Solution transfer creep (STC) is an important natural compaction mechanism and may also play an important role during production-induced reservoir rock compaction. Commonly, STC is assumed to be driven by differences in grain boundary surface normal stress. However, P. Bjørkum has proposed that STC in quartz sandstone may also be driven by increases in quartz solubility due to the presence of clay or mica at grain boundaries. Alternatively, Y. Gruzman and E. Sass have argued that STC in limestone may be driven by decay of organic matter and associated dissolution of CaCO_3 . We present an example of such chemical reaction driven STC in experiments on a rock analogue material. Dead weight indentation experiments were carried out on potassium-alum ($\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$) single crystals using steel-pistons 0.5-1.2 mm in diameter. Some experiments were carried out under the microscope. Indentation is driven by a redox-reaction between the metal piston and the weakly acid alum solution. The decrease in pH due to the redox-reaction leads to dissolution of the alum under the piston. Indentation takes place by undercutting of the piston and subsequent cataclastic deformation of the remaining pillar structure. Observed indentation rates (0.1-1.8 mm/day) are more than 3 orders of magnitude higher than for stress-induced STC at similar P-T conditions (initial contact stresses: 0-15 Mpa) and *decreased* (!) with increasing stress.