# Cataclastic solution creep of wet polycrystalline sodium chlorate aggregates

Mohsine Zahid[1] and Bas den Brok[2]
1.Institut für Geowissenschaften, Johannes Gutenberg-Universität, Becherweg 21, D-55099 Mainz, Germany.
2.Geologisches Institut ETH, Sonneggstr 5, CH-8092 Zürich, Switzerland.
(zahid@mail.uni-mainz.de; denbrok@erdw.ethz.ch)

Uniaxial dead-weight creep experiments were carried out on wet synthetic polycrystalline aggregates of sodium chlorate ($NaClO_3$) at room tempera-ture and atmospheric pressure. Aim of the experiments was to study the deformation mechanism and resulting microstructures in wet rock analo-gues that are loaded below the plastic limit within the pressure solution de-formation regime. $NaClO_3$ has a solubility and dissolution/precipitation rate comparable to that of NaCl, but it is an elastic/brittle salt. At room temperature and atmospheric pressure dry single crystals of this material fail catastrophically at differential stresses in the range 15-25 MPa. Below this stress it only deforms elastically (strain resolution ~0.05 %).

Cylindrical samples (5 mm in diameter and 10 mm long) of poly-crystalline $NaClO_3$ were loaded axially up to a differential stress of 2 MPa. The samples have a grain size in the range 180-212 µm and a porosity of 1-2%. There is about 1-2 Vol% saturated $NaClO_3$-solution present at grain boundaries and in the pores. Samples were sealed-off with latex jackets and were deformed undrained.

The mechanical data show rate-dependent steady-state creep at a strain rate of $\sim 10^{-7}$ /s up to finite bulk strains of ~6%. The data are in good agreement with mechanical data obtained in compaction experiments on porous $NaClO_3$ aggregates where pressure solution was inferred to be the dominant compaction mechanism. At axial strains higher than about 6%, samples drastically weaken and strain rates increase up to $\sim 2.10^{-6}$ /s within 6 hrs (and strains of about 18%). The optical deformation microstructures indicate that this weakening effect is associated with a transition from pres-sure solution creep to bulk (i.e., non-localised) cataclasic creep. Original grains show large numbers of healed micro fractures, mostly oriented sub-parallel to the {100} crystallographic planes. Our poster documents the mechanical data and resulting deformation microstructures.

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