



Rheology of Anhydrite during deformation in nature: a first look

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The rheology of Anhydrite under conditions of natural deformation is largely unconstrained, although it has many important effects in salt tectonics and in long-term predictions of engineering structures in salt.

A review of laboratory triaxial experiments at low temperature indicate brittle, pressure dependent behavior. At temperatures above 400 C experimental deformation shows power law creep, with contributions of dislocation creep and diffusional creep.

In naturally deformed Anhydrite rocks microstructures indicate recrystallization, solution - precipitation processes and pressure solution producing stylolites. Analysis of Anhydrite layers embedded in rock salt shows complex behavior. Bedding-parallel stretching leads to boudinage, with variable amounts of pinch-and-swell before rupture and precipitation of Halite in the boudin-neck. Bedding-parallel shortening of single layers embedded in salt leads to folding of the Anhydrite layers, with the fold shapes suggesting an effective viscosity contrast between 10 and 100. This is also in agreement with the absence of extension fracture in the outer arcs of the folds.

Although much remains to be done in accurately constraining Anhydrite rheology in nature, and for example its dependence on pore fluid pressure and chemistry, these results provide a first order estimate of Anhydrite rheology in nature, to be used in numerical simulations. A challenging task is to find a unified flow law which describes power law creep and fracturing dependent on effective stress.