

CREEP TESTS ON SALT SAMPLES PERFORMED AT VERY SMALL STRESSES

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Abstract

From 1996 to 2021, uniaxial creep tests were performed in dead-end drifts of the Varangéville mine (France) and the Altaussee mine (Austria) to take advantage of constant temperature and hygrometry. Most of them were supported by the SMRI. The applied loads were from 0.05 MPa (relative) to 4.5 MPa, i.e., much smaller than the loads currently applied during standard creep tests performed at the laboratory. Main conclusions are: (1) Steady state is reached after a long period (longer than 8 months). (2) Cumulated transient creep is relatively large (3) Strain rates are faster (than extrapolated from high stresses) by 4-5 orders of magnitude (4) Steady state strain rate is a linear function (approximately) of the applied stress in the $\sigma < 3$ MPa domain (5) Strain rate is a decreasing function of grain size (6) The transition between the linear ($n = 1$) and the non-linear ($n = 3$ to 5) behavior seems to range between 3 MPa and 4.5 MPa (7) No creep is observed in a very dry environment (8) No threshold for salt creep (or smaller than 0.05 MPa) is observed (9) In the small stress domain, reverse creep is observed. Numerical computations prove that these conclusions are important for a better understanding of salt caverns behavior.

Key words: Salt creep at low stresses, Steady state vs transient creep, Reverse creep, Influence of humidity on salt creep.