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Bearing of Petroheterogeneity on Time-Dependent Deformation of Rocksalt from Lesser Himalaya, India: An Experimental Approach

Authors : Rajendra Kumar Dubey

Abstract : Precambrian intra-rocksalt-carbonate stringers belonging to the Lower Shali Formation, Lesser Himalaya, have been investigated in view of petrological interference on deformation and mechanical response of rocksalt and its implication to understand the mechanism of differential movement of salt layers in salt body. The study elucidates the results of the time-deformation of rock salts at constant stresses of 25%, 50%, 75%, and 80% of their uniaxial compressive strengths. The cylindrical specimens (3.8cm diameter and 7.8cm) of rocksalt collected from depths ranging from RL1175 to 850 m were classified into three broad classes, namely 'phenoblastic', 'intermediate', and 'milky' rocksalt with respect to depth and deformed under medium duty creep ring. The results reveal that the compaction stress, yield stress, peak stress, and modulus of elasticity of rocksalt of greater depths exhibit minimum values in comparison to these geomechanical parameters of rocksalt of intermediate depths and shallow depths. In contrast to this, the values of compaction strains, yield strains, and failure strains show opposite trends. Similarly, time-dependent deformation of rock salts laying at the greater depths (milky salt) facilitates lower instantaneous strain, and higher creep strain may be due to higher contents of sodium chlorite (79.48 % by wt.) and angular to sub-angular shaped fine halite grained. However, the other varieties of rocksalts (phenoblastic and intermediate) show higher instantaneous strain and lower creep strain due to the domination of inherent coarse grains and concavo-convex and suture grain contacts. The study suggests strong control of petroheterogeneity on the development of instantaneous strain, transient strain, steady-state strain, and accelerated strain; however, the control of the petroheterogeneity on deformation of rocksalt loses with increased imposed stress levels. The progress of time-dependent deformation occurs due to the evolution of minute tensile and shear crack arrays in proportions along grain boundaries as well as through grains of halite to isotropic and homogeneous rock salts. The study reveals the differential mobility of salt layers in rocksalt bodies as a function of inherent petroheterogeneity and stress conditions imposed by short-term tectonic and seismotectonic stresses. In addition, the study may be useful in explaining the mechanism of a variety of salty and salt dynamic-induced structures.

Keywords : petroheterogeneity, strength, creep, rocksalt, Shali formation, Lesser Himalaya
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