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EFFECTS OF SYLVITE AND CARNALLITE CONTENT ON CREEP BEHAVIOR OF POTASH

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Abstract

Understanding the creep behavior of multiconstituent materials, such as potash, is critical for the design and long-term stability of underground openings. Intensive laboratory testing is required to determine the site-specific mechanical behavior of the geological units being excavated, particularly the creep behavior of rocks. In general, the creep behavior of rocks is influenced by their mineral content, especially the existence of weaker constituents. For example, potash from different localities contains varying ratios of halite, sylvite, and carnallite, leading to variability in creep behavior from site to site. Experiments on the creep behavior of rocks over a wide range of conditions have revealed that the presence of sylvite and/or carnallite in a halite-dominant matrix increases the overall deformation rate. Quantifying the relationship between the relative mineralogical proportions and the resulting creep rate is a key goal for rock-mechanics investigations. Thirty-seven creep tests were performed by Mellegard et al. [2012] on natural potash samples containing varying amounts of sylvite and carnallite, ranging from 0 to 26.7 percent by volume. This dataset provides a sufficient range of data to evaluate the effects of sylvite and carnallite content on the creep behavior of potash. This paper presents the results of a preliminary effort to develop a steady-state constitutive model that accounts for varying amounts of sylvite and carnallite. A power law is modified to include the relative mass fractions of halite, sylvite, and carnallite to predict the creep behavior of the dataset.

Key words: creep, sylvite, carnallite