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Investigations on the potential anisotropy of bedded rock salt using the true triaxial compression testing method

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Abstract

Measurements of true triaxial tests in the laboratory are part of the extensive research on bedded rock salt layers at the Federal Institute of Geoscience and Natural Resources (BGR) in Hannover, Germany. Significant geomechanical and hydraulic parameters are determined for the characterisation of bedded rock salt sequences that have not been explored as intensively as salt domes in the past. The primary layered character of the bedded rock salt leads to the assumption of an anisotropic behaviour, which has not been verified yet. The true triaxial testing of cubic samples allows the analysis of potentially directional material parameters and because the pressure is applied to three axes independently, individual stress conditions can be implemented.

Elastic parameters such as Young's modulus, Poisson's ratio, shear modulus and bulk modulus are derived from the true triaxial measurements as well as failure characteristics such as cubic compression strength and dilatancy. Accompanying measurements of the acoustic emission provide detection of micro crack generation. The preliminary results for the elastic parameters indicate a wide range of derived values for the analysed samples. The samples are categorized into three different structural fabric categories, which are represented by samples that show only slight directional differences for the elastic parameters on the one hand. On the other hand, samples show strongly diverging values in different directions. This heterogeneous elastic deformation behaviour leads to the assumption that a directional elastic deformation behaviour is observable on the small-scale, but contemplate all analysed samples the bedded rock salt material represents isotropic elastic deformation behaviour.

By comparing the strength of the bedded rock salt to previous measurements on salt dome material from Morsleben (Germany), it was seen that a majority of values are of the same magnitude and range and agree with the strength parameters.

Key words: bedded salt deposits, true triaxial compression test, anisotropy, salt properties, rock mechanics