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Fluid Percolation and the Tightness of Salt

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Abstract

This presentation summarises the actual knowledge regarding the tightness and integrity of salt rocks in general and rock salt in special on the basis of lab tests, in situ investigation and natural analogue concerning the long term fluid inclusion.

Pressure driven percolation is the most important failure mechanism responsible for loss of integrity of salt rock barriers at fluid pressures higher than minimum principle stress which act as the percolation threshold. Only after overcoming a percolation threshold the pressure-driven opening and interconnection of flow paths along grain boundaries is initiated in the salt rock and induces a directional percolation in the direction of the maximum principal stress.

By the means of experimental investigations it could be proven that leakage of the polycrystalline rock salt as postulated for high temperature and pressure without overcoming the percolation threshold is not possible. The reason to look what happens in the special range of pressure and temperature conditions was that a general doubt on the safe inclusion in salt also reflects on the long-term safe cavern abandonment.

Key words: rock salt, gas storage, salt caverns, cavern abandonment, rock mechanics

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