



## Permeability tests on hollow salt spheres

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Permeability tests have been performed on hollow salt spheres to avoid the boundary effects met with cylindrical samples when rock permeability is low ( $10^{-21} \text{ m}^2 < K < 10^{-19} \text{ m}^2$ ). Spheres diameter is 25 cm; the inner cavity, which is leached out at the center of the sphere, has a  $40 \text{ cm}^3$ -volume. Brine pressure in the inner cavity is made larger than brine pressure at the sphere external surface, generating an outward flow; a confining pressure is transmitted to the external surface of the sphere through a flexible jacket to analyze permeability changes resulting from effective stress build-up in the sample. To reach steady-state, tests are several day or week long.

During a test, healing of the sample (which inevitably is damaged during sampling, cutting and storage) is first observed: after a couple of days, permeability of the sample drops by 1 to 3 orders of magnitude under the effect of the compressive stresses applied to the sample. Cavity pressure is then built up step-by-step to reach and exceed the external applied stress. During the last steps, a large increase in salt permeability can be observed, under the effect of tensile effective stresses at cavern wall.

This result is of interest in the perspective of the long-term behaviour of closed and abandoned salt caverns: cavern pressure release can be expected before hydrofracturing conditions are met, even in the case when the natural permeability of the salt formation is extremely small.

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