Origin and evolution of gas in salt beds of a potash mine

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Gases encountered in different salt beds from evacuated and packer-sealed borehole sections in a potash mine were sampled and characterized for their chemical and isotopic composition so as to conclude on their origin and evolution in the salt rocks.

These gases were either generated autochthonally or originate from fluid influx from the surrounding rocks outside the salt formation. Fixation in the salt rocks can take place laminar on mineral grain boundaries, disrupter and fracture zones or trapped in inclusions inside or between mineral grains.

In situ flow tests with pure argon between several boreholes at distances ranging from decimeter to meter suggest that formation gas is stripped from the intermediate salt packet. This gas must have been trapped on grain boundaries along the pathways of the flowing argon.

The stripped formation gas comprises mainly CO$_2$ with traces of CH$_4$ and H$_2$. The CO$_2$ isotopic composition matches well with gases originating from a mantle source, whereas CH$_4$ is classified to be of thermogenic origin formed in a marine environment. Plausible explanations for the H$_2$ generation are the radiolysis of water, reaction of FeII with water or microbial processes.

We conclude that these trapped gases are of allochthonous origin migrating from the surrounding rocks into the salt formation where they were fixated mainly along fracture surfaces and fissures.