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Technical Conference Paper

Microbial risks associated with hydrogen underground storage in Europe

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Abstract

Salt caverns have been used for natural gas and oil storage in the past decades and are now under consideration to store hydrogen, which is needed in large quantities for the Green Shift of industry and society. However, salt caverns are not sterile environments and many specially adapted extremophilic microorganisms (halophiles) can live or even require high-salt conditions for their survival. These organisms will be in direct contact with the injected hydrogen, which is a ubiquitous energy source for many different microorganisms including sulfate reducers, methanogens (methane producers) or acetogens (acetate producers). While these microorganisms consume the hydrogen, they can induce microbial-triggered risks including loss of the stored hydrogen, risks to operational safety and deterioration in quality by H_2S production, biocorrosion and changes of the cavern properties due to biochemical reactions. The microbial communities living within salt caverns have been scarcely studied, but up until now all investigated caverns harbored a diverse set of microorganisms. Whether each cavern community is capable of consuming hydrogen is not clear and also if always similar communities are present. Salt caverns are leached in different geological salt structures, and the mineralogical composition differs significantly even within one salt dome. Such variations will affect the hydrochemical composition of the brine and maybe also the types of microorganisms.

We will present the overall topic of microbial induced risks within salt caverns and the latest findings of our CETP co-funded project HyLife where we investigate different potential storage locations in Europe. This will enable us to gain a better understanding of the overall role of microorganisms and their impact on hydrogen underground storage.

Key words: microbiology, hydrogen storage, H_2S, safety