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## ENABLING LARGE-SCALE HYDROGEN STORAGE IN SALT CAVERNS: RECENT DEVELOPMENTS

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### Abstract

Storing pure hydrogen in salt caverns has been practiced since the 70's in Europe, only a decade after the first natural gas storage in salt cavern was commissioned in the USA. Despite this long experience, the recent plan for hydrogen as a pillar of a future low carbon energy system has intensified the focus on hydrogen storage and prompted significant research work. It has led to technical or scientific developments in fields that were poorly understood until recently.

This article presents a high-level overview of the recent developments to the current knowledge or industrial practice for hydrogen storage in underground salt caverns. Developments regarding specificities of hydrogen towards the rock salt or brine will be presented: rock salt permeability to hydrogen, hydrogen thermodynamics and solubility in saturated brine. Adaptation of MITs will be discussed. Geochemistry reactions and risk management of the microbiological activity in the brine in presence of hydrogen will be tackled. Last, materials compatibility with H<sub>2</sub> due to its small size will be reviewed and especially the compatibility with steel and elastomer for cavern wells.

This article is an opportunity to present the recent developments that have been done regarding hydrogen storage in salt caverns, but also to discuss the technical challenges that our industry still have to overcome due notably to the lack of standards for well design and well equipment.

**Keywords:** Hydrogen Storage in Salt Caverns, Material Compatibility, Rock Salt Permeability, Hydrogen Solubility, Geochemistry with Hydrogen