The influence of gas and humidity on salt mineral compositions studied by in-situ XRD

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The CHC plus$^+$ is a non-ambient XRD chamber designed for the study of materials under humid conditions. The relative humidity (RH) can be set from 5 – 95 %RH over the temperature range 10 – 60 °C and from 5 – 70 %RH at 80 °C. In addition, the chamber can be used as a heating/cooling attachment over a temperature range of -180 – 400 °C. The sophisticated design of the CHC plus$^+$ chamber and the combination with a modern humidity generator ensures that the %RH value can be changed over a wide range without any risk of condensation within the chamber. This poster will present recent application data collected using the CHC plus+ involving the measurement of salt mineral compositions under different humidity and gas conditions.[1]

Salt deposits are increasingly being used as locations for gas storage caverns as the demand for natural gas increases following the global movement towards cleaner energy sources. Many of the most favorable sites, featuring homogeneous salt deposits, have already been exploited meaning that heterogeneous deposits are increasingly being considered as gas storage sites. However, the heterogeneous nature of these deposits means that a detailed knowledge of the phase behavior between salt, liquid, and gas is required before they can be safely used. This study focuses on the effect of humidity and gas atmosphere on various saliniferous compositions collected from a potash mine. The results allow geochemical interactions between water, gas, and salt to be simulated in order to evaluate the influence of different potential cavern fillings and rock compositions on the mineral alteration processes which take place. It shows that the type of minerals and gases present can play an important role and must be considered with regards to cavern formation and integrity in heterogeneous salt deposits.

[1] B. Strauch, M. Zimmer, A. Zirkler, S. Höntzsch, A. M. Schleicher, Adv. Geosci., 45, 227-233, 2018