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Calcium Sulphates of the Atacama Desert – The Gypsum-Anhydrite Phase Transition Revisited

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Present as gypsum ($CaSO_4 \cdot 2H_2O$), bassanite ($CaSO_4 \cdot 0.5H_2O$) and anhydrite ($CaSO_4$), calcium sulphates comprise a significant fraction of evaporite minerals in the Atacama Desert, as well as, on Mars. Field observation suggest a secondary formation process for the dehydrated sulphates, however, previous studies ruled out phase transitions by simple heating under the ambient conditions of the Atacama Desert. Based on the recorded spatial correlation of anhydrite and salts, we plan to perform flow-through experiments on synthetic and natural gypsum samples with salt brines to control and lower the activity of water necessary for the phase transitions to occur at the relevant environmental conditions. Preliminary experiments with brine of very low water activity ($CaCl_2$) show already phase transitions from gypsum to basanite and anhydrite within reasonable time scales at the proposed conditions.

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