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The study of minerals under simulated planetary conditions: Experiments of hydrated sulphates at environmental conditions of martian surface

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Minerals on planetary surfaces are usually identified comparing remote infrared spectral data to laboratory mineral databases obtained under terrestrial conditions. However, environmental conditions at other planetary surfaces could produce alterations on the standard mineral spectra.

Spectroscopic signals of hydrated magnesium, calcium and hydroxlated iron sulphates have been recently detected on surface of Mars. Some experiments using environmental conditions at the martian surface (temperature and pressure ranges; atmospheric composition, including water vapor content; and ultraviolet radiation) of different sulphates have been performed in order to both, constrain the stability of the hydrated phases and detect any possible modification in their spectra. Experiments have been done in a simulation chamber located in Centro de Astrobiologia, Madrid. The equipment has been developed for a wide range of simulation conditions, including a range of irradiation sources, and the implementation of analytical techniques, including IR and UV spectroscopy and mass spectrometry. The equipment consists of a main vacuum chamber with dimensions of 50 cm long x 40 cm diameter, a second internal chamber connected by differential pumping with the main one, and a third side chamber for the gases analysis using a mass spectrometer. Chambers pressures are monitorized by different pirani-penning gauges. A liquid nitrogen cooling system is connected to the sample holder, and a gas system allows the mixing of gases and water.