High-Pressure Phase transition in Natural Gypsum-Implication to Martian Surface Mineralogy

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Study of high-pressure behaviour of hydrous sulfates is most important both for its planetary and geological implications [1]. Hydrous sulfates have been identified on the surface of Mars as well as in the veins of Martian meteorites. Ehlmann and Edwards [1] have listed kieserite, szomolnokite, gypsum, alunite, jarosite and iron hydrous sulfates as secondary minerals phases on the Martian subsurface. In recent years there is a growing interst in study of thermodyanamic and structural investigations of sulfates with a focus on possible dehydration reaction near Martian subsurface environment. [2] In the present study , we carried out high-pressure electrical resisitivty , and Fourier –tansfrom spectroscopic measurements on natural gypsum collected from Thar desert an arid zone, which is considered to be a potentioal terrestrial analog to the Martian surface. The gypsum samples were collected from Thar desert area of Rajasthan, India. The samples were charcterised by electron probe micro anlyses (EPMA) Fourier transform infrared (FTIR) spectroscopic, differential thermal analyses and powder X-ray diffraction methods. High pressure experiments were carried out in an opposed anvil cell appartus [3] with no pressure transmitting medium. Our experments show that gypsum transforms to high-pressure phase at about 5 Gpa and becomes amorphous at 8 GPa at room temperature. The amorphous phase denser than the starting material. There are no dehydration reaction up to 8 GPa, implying that the gypsum on the surafce of Martian impact craters could retain the hydrous component even under shock metamorphism.

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