High-Pressure Phase transition and Infrared spectra of Natural antigorite- Implications For Dehydration Reactions on Martian Surface

USHA CHANDRA[1] G. PARTHASARATHY[2]

[1] Department of Physics, University of Rajasthan, Jaipur-302004, India e-mail. chandrausha@hotmail.com.

[2]CSIR-National Geophysical Research Institute, Hyderabad- 500007, India, E-mail : gpsarathy@ngri.res.in.

Seprpentinization reactions known to produce hydrogen, which are considered to be important energy source for organo-photo chemical reaction, as well as its reaction with carbon dioxide in methane production on the Martian surface. The presence of methane on the surface of Mars can be explained due to Seprpentinization reaction [1]. High-pressure studies on the phase stability of serpentine minerals are of great importance in the dehydration reaction of hydrous minerals on the impact –crater region on the Martian surface. The studied antigorite sample has been extracted from the Ararki meteorite sample High-pressure experiments were carried out in an opposed anvil cell system [2] Our present high-pressure investigations showed that antigorite undergoes a pressure induced amorphization at 6.5 to 7.5 GPa at room temperature. The amorphous nature of antigorite has been characterized by powder XRD and FTIR spectroscopic techniques. The amorphization pressure is found to be much lower than the earlier results on pure crystalline antigorite, implying the presence of dignified antigorite in the shocked meteorite. FTIR spectra of the starting antogorite sample showed several absorption peaks at 449, 562, 650, 710, 996, 1080, 1129, 1208 and 1719 cm^{-1}. High pressure spectra of the sam[ple showed very broad absorption peak at 1080 cm - 1cahracteristics of glassy or amorphous phase. However the hydorus component is found to be almost same as the initial material. We did not observe any dehydration reaction up to 8 GPa at room temperature. The observed results have strong implications on the stability of serpentine minerals in the Noachian region of the Martian surface. This work is supported by CSIR-SHORE P0205 project and PLANEX project of PRL, Space Application Centre, Ahmedabad Department of Space, Government of India.

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