Geophysical Research Abstracts
Vol. 14, EGU2012-10814-1, 2012
EGU General Assembly 2012

Search for olivine spectral signatures on the surface of Vesta

E. Palomba (1), M. C. De Sanctis (1), E. Ammannito (1), F. Capaccioni (1), M. T. Capria (1), M. Farina (1), A. Frigeri (1), A. Longobardo (1), F. Tosi (1), F. Zambon (1), H. Y. McSween (2), D. W. Mittlefehldt (3), C. T. Russell (4), C. A. Raymond (5), J. Sunshine (6), and T.B. McCord (7)

(1) IAPS-INAF, Roma, Italy (ernesto.palomba@ifsi-roma.inaf.it), (2) University of Tennesse, Knoxville TN USA, (3) Johns Hopkins University Applied Physics Laboratory, Laurel MD USA, (4) UCLA, Los Angeles, CA USA, (5) Caltech Institute Tech Jet Prop. Lab. Pasadena CA USA, (6) University of Maryland, College Park, MD, USA, (7) Bear Fight Institute, 22 Fiddlers Rd., Winthrop WA 98862 USA

The occurrence of olivines on Vesta were first postulated from traditional petrogenetic models which suggest the formation of olivine as lower crustal cumulates. An indirect confirmation is given by their presence as a minor component in some samples of diogenite meteorites, the harzburgitic diogenites and the dunitic diogenites, and as olivine mineral clasts in howardites. Another indication for this mineral was given by interpretations of ground-based and Hubble Space Telescope observations that suggested the presence of local olivine-bearing units on the surface of Vesta.
The VIR instrument onboard the DAWN mission has been mapping Vesta since July 2011. VIR acquired hyperspectral images of Vesta's surface in the wavelength range from 0.25 to 5.1 μm during Approach, Survey and High Altitude Mapping (HAMO) orbits that allowed a 2/3 of the entire asteroid surface to be mapped. The VIR operative spectral interval, resolution and coverage is suitable for the detection and mapping of any olivine rich regions that may occur on the Vesta surface.
The abundance of olivine in diogenites is typically lower than 10% but some samples richer in olivine are known. However, we do not expect to have extensive exposures of olivine-rich material on Vesta. Moreover, the partial overlap of olivine and pyroxene spectral signatures will make olivine difficult to detect.
Different spectral parameters have been used to map olivine on extraterrestrial bodies, and here we discuss the different approaches used, and develop new ones specifically for Vesta. Our new methods are based on combinations of the spectral parameters relative to the 1 and 2 micron bands (the most prominent spectral features of Vesta surface in the visible and the infrared), such as band center locations, band depths, band areas, band area ratios.
Before the direct application to the VIR data, the efficiency of each approach is evaluated by means of analysis of laboratory spectra of HED meteorites, pyroxenes, olivines and their mixtures.