Spectral measurements of howardites in support of the interpretation of the Dawn VIR spectra at Vesta

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The howardites, eucrites, and diogenites constitute a suite of meteorite lithologies (HED) known to be related to asteroid Vesta [1]. Howardites are physical mixtures of eucrites and diogenites. Howardites are divided in two subtypes: regolithic howardites are actually linked to the true regolith, while fragmental howardites are simple polymict breccias [2]. Mapping of Vesta's surface, as obtained with data from Visible and Infrared mapping Spectrometer (VIR) on Dawn [3,4], showed that it is mainly howarditic, with few regions of diogenite-rich and eucrite-rich terrains [5, 6]. In order to map quantitatively the distribution of lithologic types on Vesta, we are carrying on a study of a set of well-characterized howardites [7]. Spectra were measured on sample powders sieved to 75 µm in the laboratories of the Istituto di Astrofisica e Planetologia Spaziali (IAPS-INAF) in Rome (Italy) and Brown University, in Providence (USA). Here we report about the measurements done at IAPS-INAF. The spectra of 33 samples have been acquired with the S.LAB setup, consisting in the FieldSpec Pro© spectrometer (range 0.35–2.5 µm, spatial resolution 0.5 cm^2) coupled with a goniometer (incidence $i = 30°$, emission $e = 0°$) [8]. Some representative spectra of the measured howardites are shown in the figure. The spectra are characterized by the two broad Fe^{2+} absorption bands near 1 and 2 µm (BI and BII) indicative of pyroxenes. Band parameters relative to BI and BII have been calculated using the algorithm developed to process VIR spectra [4]. This enables us to compare laboratory data directly with the VIR results. Other weaker absorptions also characterize some spectra: the 0.5 µm feature (Mn^{2+} or Cr^{3+}) and the 1.2 µm feature possibly due to Fe^{2+} in plagioclases. The PRA04401 sample is characterized by a pyroxene-carbonaceous matter mixture [7].

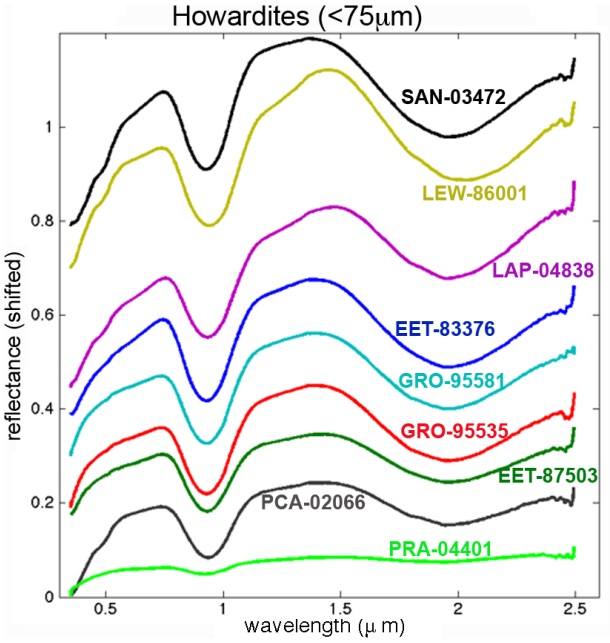

Figure: Illustrative spectra of some of the analyzed howardites.

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