VISIBLE AND NEAR-INFRARED SPECTRAL SURVEY OF NIPR METEORITE CHIP SAMPLES.

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Introduction: Visible and near-infrared (VNIR) reflectance spectroscopy is highly useful for characterizing the mineral composition of solid planetary materials such as meteorites. Especially, measuring individual clasts on the surface of meteorite chips could identify end-member minerals and their spectra, which will be highly useful in identifying rock types and their formation and evolution. In June 2010 we started a VNIR spectral survey of meteorite samples stored at the National Institute of Polar Research (NIPR) and finished those for lunar, Martian [1], and HED meteorite samples. Then, we began surveying carbonaceous chondrite (CC) samples in November 2012.

Experimental: Meteorite chip samples stored at NIPR having fresh, naturally-broken surface were identified through prescreening based on their catalog and visual examination. Bidirectional VNIR diffuse reflectance spectra of one or more spots on each chip sample were obtained at every 5 nm over the wavelength range of 0.25-2.5 μm at either the RISE Project of the National Astronomical Observatory of Japan (NAOJ) or Osaka University. A detailed description of the procedure is given in a separate paper [1]. For this study, incident beam size was about 3×2 mm. In addition, biconical Fourier Transform infrared (FTIR) reflectance spectra of those spots were measured at 4 cm^{-1} resolution over the wavelength range of 1.7-25 μm at RELAB, a NASA multiuser facility [2]. The FTIR spectra were scaled to connect with the VNIR spectra at 2.5 μm. So far, 116 meteorite samples have been measured.

Results: Martian meteorite chip surfaces looked highly homogenous as we reported [1] and derived mineralogy of each sample was consistent with previous studies. Clear plagioclase spectral features, especially the 1.25 μm absorption band was identified on lunar HED meteorite chips. Linear extrapolation and modified Gaussian model (MGM) [3] deconvolution were successfully performed on the spectra to derive end-member mineral spectra or the band parameters [4]. Carbonaceous chondrite types and diversity of CM chondrites were successfully recognized, including those thermally metamorphosed and having unusual 3 μm band shape [5].

Conclusions: It has been successfully proven that VNIR reflectance spectral measurements of millimeter-size spots on naturally-broken meteorite chip surfaces can produce useful information on their mineralogy. This method is especially useful for the classification and mineralogical characterization of meteorites in both the laboratory and planetary landing missions.

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