Visible and Near-Infrared Spectral Survey of Select HED Meteorite Samples Stored at the National Institute of Polar Research. T. Hiroi[1,2], H. Kaiden[2], K. Misawa[2], H. Kojima[2], and Sho Sasaki[3], [1]Dept. of Geological Sciences, Brown University, Providence, RI 02912, USA, [2]Antarctic Meteorite Research Center, National Institute of Polar Research, 10-3, Midori-cho, Tachikawa, Tokyo 190-8518, Japan, [3]RISE Project, National Observatory of Japan, Oshu, Iwate 023-0861, Japan.

Introduction:

Howardites, eucrites, and diogenites (HEDs) are a group of basaltic meteorites, many of which are breccias. Studying HEDs allows scientists to study the evolution of a basaltic body which could not become large enough to be called a planet. Dawn spacecraft is currently in rendezvous with the asteroid 4 Vesta, which is believed to be the parent body of most of HEDs. Spacecraft missions including Dawn never landed on an asteroid or performed close-up spectroscopy, until Hayabusa touched down on the asteroid 25143 Itokawa and acquired sub-cm resolution images and cm-resolution near-infrared (NIR) spectra [1]. This visible and NIR (VNIR) spectral survey of HED meteorite samples is aimed at identifying and studying the mineral phases of extraterrestrial basaltic rocks either in laboratory or by future spacecraft missions. This is an on-going study, and a preliminary report is presented at the symposium.

Experimental:

HED meteorite samples stored at the NIPR are considered for this study. Out of 217 catalogued HED meteorites of the NIPR, 13 howardites, 53 eucrites, and 34 diogenites were selected for our measurements by considering freshness and texture (having a natural, broken surface). Bidirectional VNIR diffuse reflectance spectra of several spots on each sample were obtained. A detailed description of the procedure is described in a separate paper on Martian meteorite samples [2]. For this study, incident beam size was mostly the same 3×2 mm as before, and a smaller beam size of about 2×1.5 mm was also introduced for measuring the purer spectra of small mineral phases or clasts. We have finished measuring the howardite samples but are still in the middle of measuring the eucrite samples.

Preliminary Results:

Shown in Fig. 1 are three chips of eucrite Yamato (Y)-74450, indicating several measured spots with red circles, wherein spots A and C were measured with two different beam sizes to obtain purer spectra of single mineral phases.

The spectral data of the spots A and C are plotted in Fig. 2. When the beam size is small enough to cover only the single mineral phases, the obtained reflectance spectra naturally showed those of highly-pure plagioclase (C2) and spinel (A2). In this way, spectral data of minor mineral phases contained in HED meteorites can be obtained, instead of being strongly influenced by optically highly active pyroxene component.

Summary:

This study has proven that VNIR spectral measurements of HED chips is highly useful for identifying and characterizing those component minerals which are difficult to detect from bulk sample measurements dominated by pyroxene.

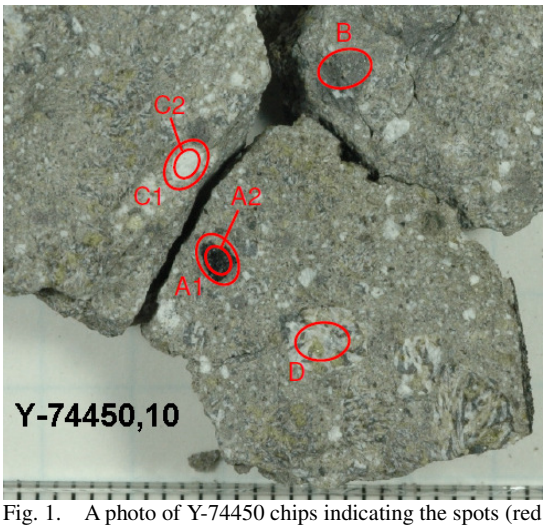

Fig. 1. A photo of Y-74450 chips indicating the spots (red circles) where VNIR reflectance spectra were measured.

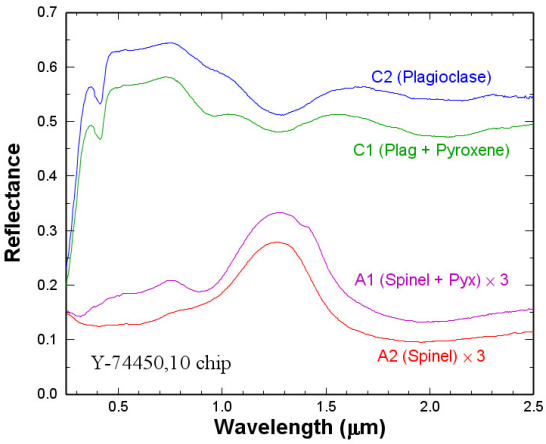

Fig. 2. VNIR reflectance spectra of some of the spots on Y-74450 chips shown in Fig. 1.

References: [1] Hiroi T. et al. (2007) *LPS XXXVIII*, Abstract #1048. [2] Hiroi T. et al. (2011) *Polar Sci. 5*, 337-344.