NEAR-INFRARED SPECTROSCOPY OF VESTOIDS

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Introduction: Asteroid 4 Vesta is the most studied asteroid due to its large size (~500 km diameter) and its spectral resemblance to the HEDs (howardites, eucrites, and diogenites) [1]. A number of smaller (≤10 km diameter) objects (called Vestoids) have also been found [2, 3, 4] to have a spectral resemblance to the HEDs. The Vestoids have been found both inside and outside the dynamical boundaries defined for the Vesta family.

We have instituted a near-infrared spectral study of a number of Vestoids to determine their mineralogy. The goal of our study is better understand the compositional diversity of basaltic material on the scale of ~10 km.

Telescopic Data: Near-infrared telescopic data were obtained using SpeX [5], a low- to medium-resolution spectrograph at the NASA Infrared Telescopic Facility on Mauna Kea. Six different Vestoids (1906 Naef, 2653 Principia, 2851 Harbin, 3782 Celle, 3869 Norton, and 4215 Kamo) were observed over the course of two nights. Also, a set of five to six solar-like stars were observed each night. Standard reduction techniques were used to reduce the spectra. Each asteroid's near-infrared reflectance spectrum is scaled to overlap its visible spectrum [6, 7], which results in wavelength coverage from ~0.4 to 2.5 μm.

Analysis: The Vestoids all have distinctive absorption bands centered near 0.9 (Band I) and 1.9-2.0 μm (Band II) due to pyroxene plus a shallow inflection centered near 1.2 μm due to plagioclase. The wavelength position of the Band II center is a function [8] of the average pyroxene composition of the material with eucrites having Band II centers at longer wavelengths than the diogenites due to the more Ca-and Fe-rich nature of the eucritic pyroxenes. The Band II centers of the Vestoids are most consistent with those of polymict eucrites/howardites [3], implying appreciable amounts of diogenitic material on their surfaces.

Conclusions: Near-infrared reflectance spectra of these six Vestoids confirm the basaltic nature of their surfaces. Our future work will be to determine mineralogies of these objects.

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