REFLECTANCE SPECTRA OF SELECTED CARBONACEOUS CHONDRITES

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Introduction: We are engaged in an ongoing investigation of the systematic spectral reflectance properties of carbonaceous chondrites. Here we present preliminary results for the 0.3-2.6 µm interval for four samples measured to date: MET00639 (CM2), WIS91600 (CM2), ALH82101 (CO3), and ALH85002 (CK4).

Results: MET00639 is characterized by low overall reflectance (<3%) and weak evidence for an absorption band near 1.1 µm, broadly consistent with olivine, the major mafic silicate in CM2 chondrites. The spectrum of WIS91600 is characterized by low overall reflectance (<4%) with a broad and weak superimposed absorption feature in the 1-µm region. ALH82101 is characterized by higher overall reflectance (up to 19%) and two well-defined absorption features located near 1.05 and 2.1 µm. These features are consistent with olivine (for the 1.05-µm feature) and pyroxene and/or spinel for the longer wavelength band. ALH85002 also exhibits higher overall reflectance (up to 16%) and absorption features near 1.05 and 1.3 µm, as well as a broad and weak absorption feature in the 2-µm region. These features are consistent with olivine (1.05 µm), plagioclase feldspar (1.3 µm), and pyroxene and/or spinel (2 µm).

Discussion: The reflectance spectra of the current samples are consistent with the spectra of carbonaceous chondrites measured by other investigators [1,2]. The diversity of spectral shapes and low overall reflectances (lower than expected for the dominant silicates) are due to the presence of various finely-dispersed opaque materials, such as carbonaceous phases, magnetite, metal, and troilite. Depending on the abundance, type, and disposition of the opaque phases, both spectrally neutral and red-sloped spectra could result [3]. The spectrum of ALH82101 (CO3) exhibits the most well-resolved absorption feature in the 2-µm region. It provides the strongest spectral evidence for spinel in spite of the expected low abundances of this mineral (on the order of a few percent) [4]. CO3 chondrites are also the most spinel-rich carbonaceous chondrite class [5]. The fact that all of the carbonaceous chondrites exhibit resolvable absorption bands that can be attributed (with varying degrees of confidence) to specific mineral phases suggests that high signal-to-noise reflectance spectra of asteroids may be able to identify possible parent bodies for dark meteorites and/or provide information on the non-opaque phases which comprise them.

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