COMPARISON OF VISIBLE AND NEAR-INFRARED REFLECTANCE SPECTRA OF CM2 CARBONACEOUS CHONDRITES AND PRIMITIVE ASTEROIDS; F. Vilas, T. Hiroi, and M. E. Zolensky, NASA Johnson Space Center, Houston, Texas.

Spectra of primitive asteroids (here defined as C, P and D classes and associated subclasses) have been compared to the limited number of spectra of CM2 carbonaceous chondrites [1, 2]. An absorption feature located at 0.7 μm attributed to an $Fe^{2+}$ - $Fe^{3+}$ charge transfer absorption in iron oxides in phyllosilicates is apparent in some of the CM2 carbonaceous chondrite spectra and many of the asteroid spectra. Sawyer [2] has found a correlation between the area of the 0.7-μm feature and the mean semimajor axis of the asteroids. Spectra of a larger sample of carbonaceous chondrites, including 7 CM2 chondrites, covering a spectral interval of 0.30 - 2.5 μm have recently been obtained using the Relab instrument at Brown University. These spectra have been compared with spectrophotometric asteroid observations in a separate abstract in this volume [3]. We have taken those spectra of CM2 chondrites and isolated the UV, visible and near-infrared spectral regions in order to compare them with high-quality narrowband reflectance spectra (Fig. 1).

In order to study any existing features most effectively, each meteorite spectrum was treated as a continuum with discrete absorption features superimposed on it for the spectral interval which was roughly common with the asteroid spectra (0.49 - 1.0 μm). A simple linear continuum was defined by a linear least squares fit to the spectral data points of the meteorite. The continuum was then divided into each individual spectrum, thus removing a sloped background and allowing the intercomparison of residual spectral features. Figure 2 shows residual spectral features for the 7 CM2 chondrite spectra. Each spectrum shows the 0.7-μm feature seen in some earlier spectra, spectra of many asteroids, and spectra of some terrestrial phyllosilicates [4]. Some of these spectra show the shoulder located at 0.63 μm seen in some primitive asteroid spectra [5]. The width of the feature varies. In some spectra, an absorption feature near 0.9 μm is also present. This feature, presently unexplained, is in an area of an asteroid's spectrum that would be heavily affected by the incomplete removal of telluric water absorptions. Thus, comparisons of this feature with any similar feature in asteroid spectra must be conducted very carefully.

Sample C- and G-class asteroid spectra showing this feature are shown in Fig. 3. Sawyer [2] found that the 0.7-μm $Fe^{2+}$- $Fe^{3+}$ feature was found predominantly in spectra of main-belt asteroids. Vilas and Gaffey [1] demonstrated that the spectral presence of this feature extends into the outer belt (heliocentric distances > 3.2 AU), but diminishes in intensity at the mean semimajor axes of the Hildas (4.0 AU) and is nonexistent at the distance of the Trojans (5.2 AU). Independent studies of the 3.0-μm water of hydration band also indicative of the presence of phyllosilicates also show a strong absorption in C- and G-class asteroids diminishing to nonexistent in the P- and D-class asteroids. It is reasonable to expect that the 0.7-μm absorption feature is indicative of aqueous alteration products. We examined whether change in this absorption feature correlated in any way with the sequence proposed by Browning et al. [6] for evidence of progressive aqueous alteration products in CM2 chondrites. The sample of common meteorites is limited to 3 (Murray, Mighei and Cold Bokkeveld), but loosely suggests that the absorption feature becomes slightly deeper and extends further into the near-IR.

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References: [1]Vilas, F. and Gaffey, M. J., Science 1989;[2]Sawyer, S. R., Ph.D. Thesis, U. Texas, 1991; [3]Hiroi, T., Pieters, C. M., Zolensky, M. E. this volume; [4] King, T. V. V., Ph.D. Thesis, U. Hawaii, 1986; [5]Jarvis, K. S., Vilas, F., and Gaffey, M. J., this volume; [6]Browning, L. B., McSween, H. Y. and Zolensky, M. E., this volume.

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Fig. 1

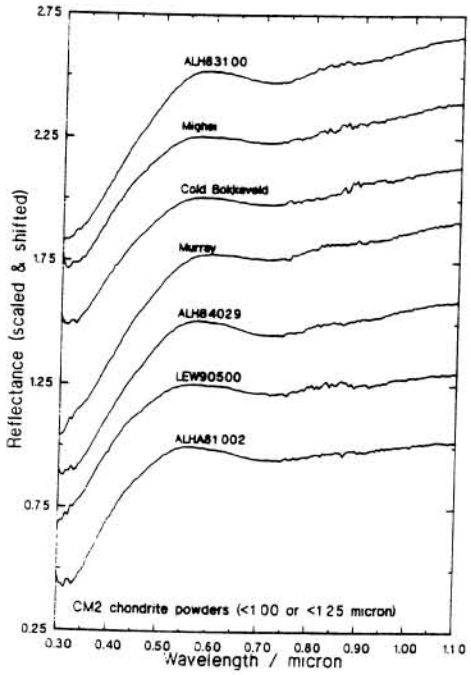


Fig. 2 CM2 CHONDRITE POWDERS WITH BACKGROUND CONTINUUM REMOVED

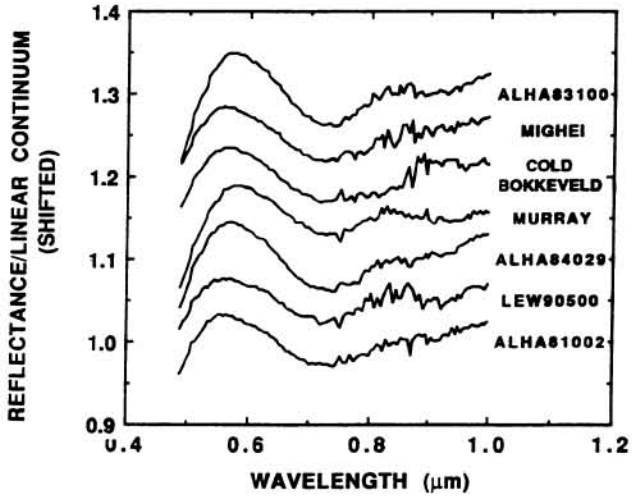


Fig. 3 MAIN-BELT C-CLASS ASTEROIDS 0.7 μm ABSORPTION FEATURE