A HIGH RESOLUTION CCD SPECTROSCOPIC SURVEY OF LOW ALBEDO MAIN BELT ASTEROIDS; S.R. Sawyer

The results of a high resolution , high signal-to-noise ratio CCD spectroscopic survey of 44 dark asteroids is presented. The sample consists of 40 main belt asteroids, 3 Cybeles and 1 Hilda, and includes asteroids of Tholen taxonomic classes C, B, F, G, and P (1). Also, spectra of a few S asteroids and Vesta are presented for comparison. The spectral coverage for this sample is about 0.5 to 0.95 microns. Additionally, spectra of more limited spectral coverage are presented: 15 covering 0.73 to 0.95 microns and 10 covering 0.4 to 0.65 microns (the last group is primarily P and D outer belt asteroids and includes several Trojans). The coverage of these partial spectra is not sufficient for detailed anaysis, but does suggest the presence or absence of absorption features for these objects.

The spectra display broad, shallow absorption features between 0.5 and 0.9 microns with typical depths of a few percent (varying between <1% to 10%). These features are similar to those reported by Vilas and Gaffey (2), but are generally stronger. The spectra are similar to spectra of two phyllosilicate groups, the serpentines and the chlorites (3), and to spectra of the CM2 carbonaceous chondrites Meghei, Murchison, and Nogoya.

Phyllosilicates have been reported in the CM2 carbonaceous chondrites and the spectral similarities suggest that these asteroid features arise from iron oxides in phyllosilicates which were formed by aqueous alteration processes. If this is the case, then study of these absorption features may provide clues to the nature of the heating mechanism responsible for the alteration. Vilas and Gaffey (2) studied primarily outer belt asteroids and found generally weak features, with the outermost objects having no detectable features at all. They concluded that this favored a heating source with a heliocentric dependence. The current survey supports this conclusion, since the main belt asteroids display generally stronger features. Measurements of the band areas of these features reveals evidence of a heliocentric trend across the main belt. However, this result must be refined by considering the effects of albedo and asteroid diameter. The dark surface material which gives these asteroids their low albedos also reduces spectral contrast, reducing the band areas. Also, a heating source such as electrical induction depends on both heliocentric distance and asteroid size (4). Corrections for these effects are presented and discussed.

REFERENCES

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