

Ultraviolet reflectance spectra of primitive meteorites

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Reflectance spectra of a large number of primitive meteorites have been collected to obtain mineralogical information of the asteroid surfaces. However, properties of ultraviolet reflectance spectra of primitive meteorites, carbonaceous chondrites, are not well understood [1–3] because of very low reflectivity of the meteorites and the lack of best-suited standards in the ultraviolet wavelength region. Nevertheless, ultraviolet reflectance spectra of primitive meteorites may provide new mineralogical and chemical information and facilitate more detailed classification of asteroids.

In this study, ultraviolet reflectance spectra of a primitive carbonaceous chondrite were measured. The reflectance was normalized relative to the best-suited standard for the ultraviolet region that we selected. The detector is an Ocean Optics Maya2000 PRO that has sensitivity in a range from 165 to 620 nm and spectral resolution of 0.035–0.68 nm. Light source is a deuterium lamp with vacuum ultraviolet-radiation. We tested and evaluated a wide variety of materials as a candidate for a reflectance standard, including Spectralon, BaSO₄, CaF₂, and Quartz in a way similar to those described in [1]. As a primitive meteorite sample, a hydrous CM carbonaceous chondrite LEW 85311 was used: it was crushed into a powder with <155 μm in size and used for spectral measurements.

The results of the test measurements for standard materials suggest that Quartz is the best reflectance standard in the ultraviolet region because it has the high and flat spectrum in a range from 200 nm to 250 nm. The reflectance spectra of a hydrous carbonaceous chondrite show low reflectivity of 1–3 %, and two broad absorptions at 230 and 300 nm. We interpret that the observed absorption at 230 nm may be attributed to the p-p* transition in PAHs (polycyclic aromatic hydrocarbon) [e.g. 2] rather than the Fe³⁺–O charge transfer in silicates [1]. The absorption at 300 nm may be attributed to the Fe³⁺–O charge transfer in oxides [e.g. 3] rather than the Fe²⁺–O charge transfer in silicates [1]. New knowledge of asteroids may be obtained by further understanding both absorptions at 230 and 300 nm of the carbonaceous chondrite spectra.

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