CARBONATES IN SOME METEORITES: INFORMATION FROM ABSORPTION BANDS NEAR 7 μm. M. Miyamoto, College of Arts and Sciences, University of Tokyo, Komaba, Tokyo 153, Japan.

We studied carbonates in meteorites on the basis of absorption bands near 7 μm of infrared diffuse reflectance spectra. Infrared spectra of both the Murchison meteorite (CM2)(1) and interplanetary dust particle (2) show the 6.8 μm band, which is due to primary carbonates. The spectra of Antarctic meteorites show the 7.4 μm band, which is due to carbonates probably produced by terrestrial weathering (3). The spectra of both Yamato-691 (enstatite chondrite) and Norton County (enstatite achondrite) show absorption bands near 6.8 μm. We carried out chemical dissolution experiments on the meteorites to determine whether the 7 μm bands could be caused by carbonates. Etched samples were exposed to 0.5M HCl at 25°C for 10 minutes. Samples of Antarctic meteorites we used were supplied by the National Institute of Polar Research. Details of infrared spectra measurements are described in Miyamoto (1988)(4).

Antarctic chondrites: During the course of studies of weathering by using absorption bands near 3 μm of infrared reflectance spectra of Antarctic meteorites (4), we found faint absorption bands near 1350 cm^{-1} (7.4 μm)(Fig. 1). The 7.4 μm band disappears from the spectrum of the etched sample (3). Because sulfates and phosphates do not easily dissolve in such weak acid when exposed for short times, we concluded that the 7.4 μm band of Antarctic chondrites is probably caused by carbonates (3). The spectrum of artinite shows the wavelength positions of absorption bands near 7.4 μm similar to those of Antarctic chondrites. This result is consistent with the presence of hydrated Mg-carbonates (nesquehonite and hydromagnesite) in some Antarctic meteorites (5,6). Non-antarctic meteorites Nuevo Mercurio (H5)(fell 1978), Bjurböle (L4)(fell 1899), and Allende (CV3)(fell 1969) do not show the 7.4 μm band (Fig. 1). Therefore, the hydrated carbonates are probably formed by terrestrial weathering (5,6). Because infrared spectra of almost all the Antarctic chondrites we measured show faint absorption bands near 7.4 μm, hydrated carbonates produced by terrestrial weathering seem to be common in Antarctic chondrites. Our preliminary examination on the basis of infrared spectra shows that the hydrated carbonates tend to concentrate on the surface portion of a meteorite. We need to take into account the presence of hydrated carbonates produced by terrestrial weathering when we study Antarctic chondrites. We can easily detect the presence (or absence) of carbonates produced by terrestrial weathering, using absorption bands near 7.4 μm of infrared diffuse reflectances of meteorites.

The Murchison spectrum shows absorption bands near 1450 cm^{-1} (6.8 μm), which is due to primary calcite (Fig. 2)(1,7). The wavelenth position is different from that of hydrated carbonates formed by terrestrial weathering in Antarctic meteorites.

Enstatite chondrite: Figure 2 compares the spectrum of an etched sample of the Y-691 enstatite chondrite (EH3) with that of an unetched sample. The spectrum of the unetched sample of Y-691 shows faint absorption bands near 1450 cm^{-1} (6.8 μm), whose wavelength position is similar to that of Murchison but is different from that of hydrated carbonates produced by terrestrial weathering. The 6.8 μm band of Y-691 disappears from the spectrum of the etched sample (Fig. 2). Carbonate is the most likely candidate for the cause of the 6.8 μm band of Y-691. Norton County (enstatite achondrite) also shows similar absorption bands near 6.8 μm. We need further studies to identify the mineral species that causes the 6.8 μm band of Y-691. The spectrum of the ALH-77257 ureilite shows no absorption bands near 6.8 μm (Fig. 2).

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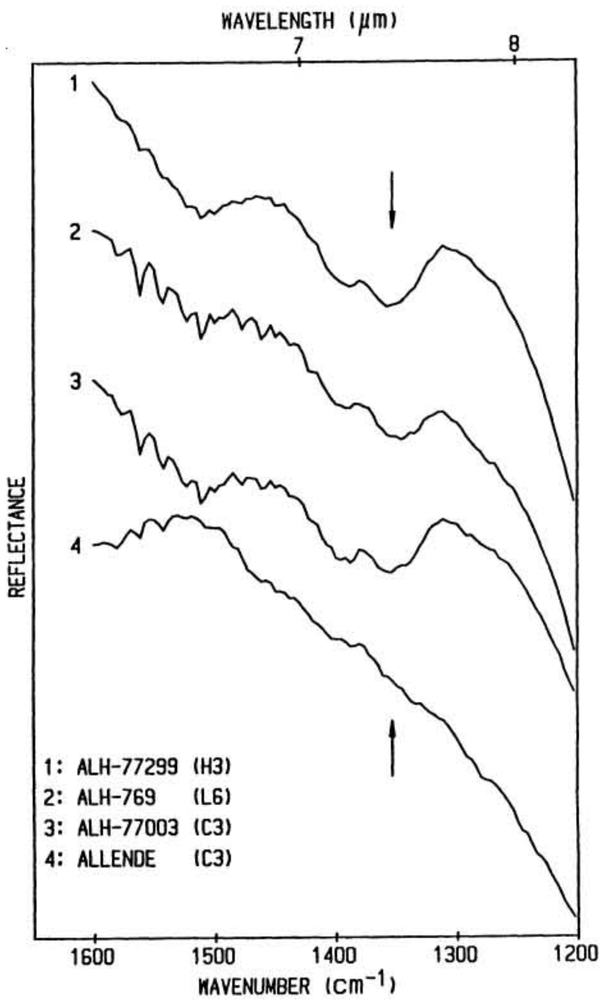

Fig.1. Infrared diffuse reflectances from 1600 to 1200 cm^{-1} of some Antarctic chondrites and Allende. Arrows indicate the 1350 cm^{-1} band.

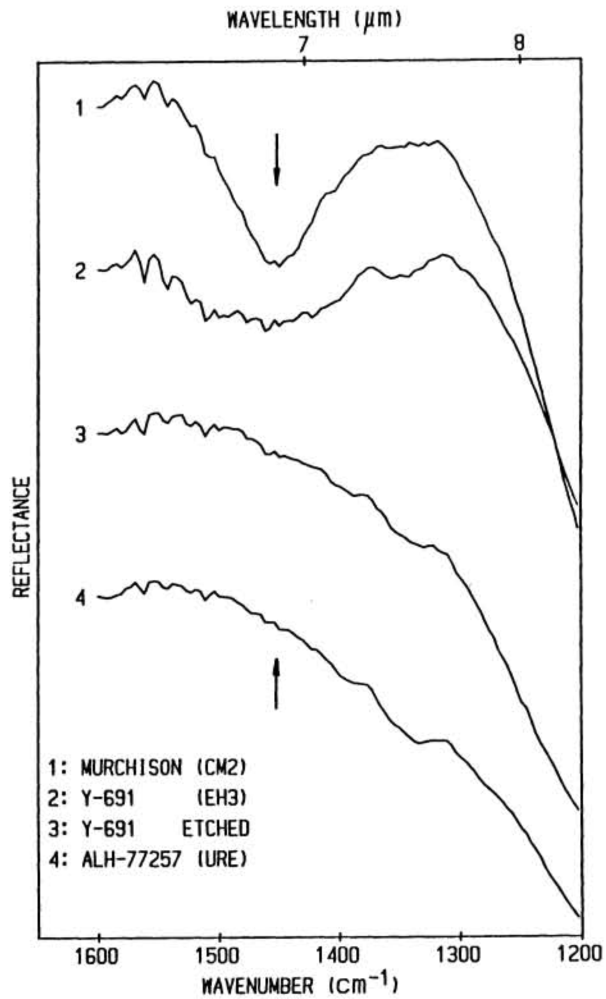

Fig.2. Comparison of absorption bands near 1450 cm^{-1} between unetched(2) and etched(3) samples of the Y-691 enstatite chondrite. Arrows indicate the 1450 cm^{-1} band.