INFRARED DIFFUSE REFLECTANCE SPECTRA OF SOME ANTARCTIC CARBONACEOUS CHONDRITES; M. Miyamoto, Department of Pure and Applied Sciences, University of Tokyo, Komaba, Tokyo 153, Japan.

Mineralogical and petrologic investigations have revealed thermal metamorphic features of carbonaceous chondrites with CI-CM affinities among Antarctic carbonaceous chondrites(1-9). Infrared diffuse reflectance spectra(2.53-25 μm) of some Antarctic carbonaceous chondrites were measured to study effects of thermal metamorphism on the spectra. Meteorite samples were ground in a corundum mortar and sieved by a 100 μm teflon sieve. Details of diffuse reflectance measurements are described in Miyamoto(10).

Absorption bands near 3 μm: Absorption bands near 3 μm are caused by hydrates and/or hydroxyl ions. Fig. 1 shows reflectance spectra of some Antarctic carbonaceous chondrites. The spectrum of the Yamato(Y-) 791198 shows strong absorption bands near 3 μm similar to those of Murchison (CM2)(11), consistent with mineralogical study with TEM(1,5). The other carbonaceous chondrites (Belgica(B-) 7904, Y-86720, Y-793321, Y-82162) show weaker absorption bands near 3 μm compared with Y-791198. Because the integrated intensity of absorption bands near 3 μm is related to the amount of hydrous minerals, the carbonaceous chondrites which show weak 3 μm bands contain less amount of hydrous minerals compared with Y-791198.

In B-7904, phyllosilicates are considerably dehydrated and almost completely transformed to olivine (5,6,8), although B-7904 is classified as CI on the basis of oxygen isotopic compositions(12). Y-86720 is thermally metamorphosed and is genetically related to B-7904. They were derived from similar precursors and experienced different degrees of aqueous alteration in a common environment(6). Y-793321 which is also thermally metamorphosed contains an intermediate phase in the transformation from serpentine to olivine(5). Although the general petrology of Y-82162 resembles the CI chondrite, this meteorite probably has been affected by mild thermal metamorphism(3).

In short, B-7904, Y-86720, Y-793321, and Y-82162 are more or less thermally metamorphosed and Y-791198 resembles ordinary CM chondrites. The absorption features near 3 μm are consistent with mineralogical and petrologic studies. Thermally metamorphosed carbonaceous chondrites show weak absorption bands near 3 μm (Fig. 1), suggesting that hydrous minerals in the carbonaceous chondrites were dehydrated by thermal metamorphism.

Major absorption intensities near 3 μm of the thermally metamorphosed carbonaceous chondrites (B-7904, Y-86720, Y-793321, Y-82162) are probably due to the secondary hydrous minerals produced by terrestrial weathering, because the shape of spectral curves near 3 μm is similar to that of Antarctic ordinary chondrites(10) and the wavelength position of reflectance minimum is slightly different from that of Y-791198 (Fig. 1). Absorption bands near 7 μm: Fig. 2 shows the results of diffuse reflectance spectra near 7 μm. The spectrum of Y-791198 shows absorption bands near 6.9 μm (1450 cm⁻¹) similar to Murchison (CM2), probably due to primary calcite(13). The spectra of B-7904, Y-86720, and Y-793321 which are thermally metamorphosed show no absorption bands near 7 μm, suggesting that most carbonates were decomposed during heating events. Although Y-82162 shows weak absorption bands near 3 μm as a result of dehydration (Fig. 1), absorption bands near 7 μm are seen in the spectrum (Fig. 2), that is, Y-82162 contains relatively large amount of carbonates compared with the other thermally metamorphosed carbonaceous chondrites. In fact, Mg-Fe
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carbonates are detected in Y-82162(3). This result suggests that metamorphic temperature of Y-82162 is high enough to decompose hydrous minerals, but is not enough to decompose carbonates, or that Y-82162 experienced later alteration process after heating events which decomposed hydrous minerals.

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Fig.1. Infrared diffuse reflectance spectra near 3 $\mu$m of Antarctic carbonaceous chondrites.  

Fig.2. Infrared diffuse reflectance spectra near 7 $\mu$m. Arrows show the 6.9 $\mu$m (1450 cm$^{-1}$) band.