MET00432: Another Tagish Lake-type Carbonaceous Chondrite from Antarctica.

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Introduction: Tagish Lake meteorite [1] is an ungrouped carbonaceous chondrite characterized by saponite-rich mineralogy [2, 3], reflectance spectra similar to D-type asteroids [4], distinct organic chemistry [5, 6] and the presence of C globules [7]. It is a breccia with complex cosmic-ray exposure history [2,8]. On the other hand, MET00432 is classified to CM2 meteorite [9], but our preliminary mineralogical analysis showed that the meteorite differs from typical CM2 in many respects [10]. In the present study, we characterized detailed mineralogy and measured bulk oxygen isotope ratios and reflectance spectra and compared the results with Tagish Lake meteorite.

Results and discussion: The abundance and the size of chondrules are similar to CM2. They are highly altered and replaced in major parts by phyllosilicates. Twenty pieces of matrix with diameter 100 to 200 μm were analyzed by synchrotron X-ray diffraction and the result shows that matrix consists of abundant saponite and magnetite, moderate amounts of dolomite, pyrrhotite, and pentlandite, and minor amounts of serpentine. Petrographic observation of matrix by FE-SEM indicates that matrix contain abundant magnetite framboids and carbonates. Carbonate compositions differ from those in Tagish Lake. Sulfides are pyrrhotite and pentlandite. Pyrrhotite platelets are abundant in some places in matrix. TEM observation revealed that phyllosilicates are mostly well-crystalline saponite with minor serpentine.

Reflectance spectrum of MET00432 in the 0.3- to 2.5-micrometer wavelength range differs from CM2 such as Murchison, but similar to Tagish Lake [4]. It shows low albedo (~5%) and positive slope with 1.9-μm saponite absorption band and without 0.7-μm band by cronstedtite. Oxygen isotope compositions of small bulk pieces (~5mg) distribute below TF line in a range of $\delta^{18}O$ from 10 to 14‰, similar to Tagish Lake [11].

Our results showed that MET00432 is very similar to Tagish Lake meteorite [2, 3] with respect to silicate and oxide mineralogy, oxygen isotope ratios, and reflectance spectra. Therefore, MET 00432 is another Tagish Lake-type carbonaceous chondrite. Differences to Tagish Lake in carbonate and sulfide mineralogy and in the degree of aqueous alteration suggest that parent asteroids of the Tagish Lake-type chondrites have a range of variations in aqueous alteration conditions, as seen in other hydrated carbonaceous chondrites.

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