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*宮原 正明[1]、大谷 栄治[2]、El Goresy Ahmed[3]、Lin Yangting[4]、菅 大暉[1]、大東 琢治[5]
*Masaaki Miyahara[1], Eiji Ohtani[2], Ahmed El Goresy[3], Yangting Lin[4], Hiroki Suga[1], Takuji Ohigashi[5]

1. 広島大学理学研究科地球惑星システム学専攻、2. 東北大学理学研究科地学専攻、3. Bayerisches Geoinstitut, Universität Bayreuth、4. Key Laboratory of Earth and Planetary Physics, Institute of Geology and Geophysics, Chinese Academy of Sciences、5. 分子科学研究所UVSOR施設
1. Department of Earth and Planetary Systems Science, Graduate School of Science, Hiroshima University, 2. Department of Earth Sciences, Graduate School of Science, Tohoku University, 3. Bayerisches Geoinstitut, Universität Bayreuth, 4. Key Laboratory of Earth and Planetary Physics, Institute of Geology and Geophysics, Chinese Academy of Sciences, 5. UVSOR Synchrotron, Institute for Molecular Science

Almahatta Sitta meteorites are fragments of Near Earth Object (NEO) 2008 TC3 impacted the Earth at north Sudan on October 7th, 2008. Many previous studies revealed that ureilite, ordinary chondrite, enstatite chondrite, carbonaceous chondrite and R-type chondrite are included in Almahatta Sitta meteorites. Among them, ureilite is the major constituent of Almahatta Sitta meteorites. Ureilite is an ultra-mafic rock and consist mainly of olivine and minor pyroxene. It is expected that ureilite originates from a carbon-rich differentiated parent-body because it includes abundant amount of carbon such as graphite and diamond, distinguished from all known carbonaceous chondrites in isotopic compositions. Although many ureilite samples have been recovered so far, the ureilites belonging to Almahatta Sitta shows unique features. We described the petrological, mineralogical and geochemical features of Almahatta Sitta ureilites using FE-SEM, laser micro-Raman, FIB-TEM, NanoSIMS and STXM techniques. Almahatta Sitta ureilites can be divided into two major groups based mainly on the grain size of olivine; i) coarse-grained ureilites and ii) fine-grained ureilites. Individual coarse-grained and fine-grained ureilites have distinguished features. One of the coarse-grained ureilites Almahatta Sitta (MS-170) contains coarse diamond grains (up to ~100 micro meter in diameter) that has never found in other ureilites. Most diamond grains included in other ureilites are fine-grained (nm to several micro meter orders in size). It is expected that these diamond grains were formed from graphite through a dynamic episode occurred on its parent-body. However it is unlikely that such coarse-grained diamond grains in Almahatta Sitta (MS-170) were formed by a transient high-pressure condition induced by a dynamic episode. It is likely that the coarse diamond grains were formed in the deep interior of an ureilite parent-body or through the CVD process in the solar nebular gas. On the other hand, the occurrences of graphite and diamond in the Almahatta Sitta fine-grained ureilites (e.g., MS-168) are similar to those of the other ureilites previously investigated. Fine diamond grains (several nano meters in size) occur in fiber-shaped graphite assemblage between olivine grains. Some fine-grained ureilites include metallic Fe-Ni pools besides olivine and pyroxene. Fiber-shaped graphite assemblages occur in the metallic Fe-Ni pools. Similar occurrences of graphite were found in enstatite chondrites such as EL3 type, which are expected to be a condensation product from the solar nebular gas. However, this is not the case for the ureilites belonging to Almahatta Sitta. The formation process of the graphite in the metallic Fe-Ni pools has been still enigmatic.

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