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Comparison between mesostasis materials of chondrule and aggregate in the Allende meteorite

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Meteorites are primitive planetary materials that preserve information of the primordial solar system. Chondritic meteorites have not experienced high temperature processes at accumulation and in parent bodies. Especially, carbonaceous chondrite is the most primitive meteorite. Allende meteorite, a typical CV carbonaceous chondrite, contains the oldest component of the Solar System. Allende meteorite consists of chondrule, aggregate, and matrix, etc. Chondrule is chiefly composed of the silicate minerals and the mesostasis material. Mesostasis in chondrules are the amorphous materials quenched at the chondrule formation. Mesostasis is relatively more vulnerable to low temperature alteration than crystalline minerals.
In the present study, detailed analysis of the mesostasis in chondrule and aggregate of the Allende meteorite were carried out. Thin sections of Allende meteorite are observed with polarizing microscope and scanning electron microscope (SEM), and analyzed with energy dispersive X-ray spectroscopy (EDS).
Amorphous phases like mesostasis in chondrules occur between mineral grains of amoeboid olivine aggregate and CAIs. In the mesostasis materials of chondrules, microcrystals of olivine and pyroxene were observed. Composition of the mesostasis phases in chondrules is distributed mostly from that of anorthite to Si-rich direction in Si-Al-Na ternary diagram. However, substantial Na-rich materials those compositions are similar to nepheline and sodalite occur. On the other hand, composition of mesostasis formed in aggregates is distributed from that of anorthite to Al-rich direction. In the aggregates, Na-enrichment trend also can be seen. The results of this study suggest that mesostasis phases experienced common alteration processes which brought enrichment of Na component in chondrules and aggregates.

Keywords: Allende meteorite, chondrule, aggregate, mesostasis, alteration