An Amoeboid Olivine Aggregate in Polymict Eucrite LEW 85300

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Amoeboid olivine aggregates (AOAs) are irregularly shaped objects commonly observed in carbonaceous chondrites. Because they are composed of fine-grained olivine and Ca-Al-rich minerals, they are sensitive indicators for nebular processes and parent body alteration [e.g.,1].

Recently an AOA was found in a carbonaceous clast in polymict eucrite LEW 85300 [2]. The bulk major element composition of the clast matrix in LEW 85300 suggests a relation to CM, CO and CV chondrites, whereas bulk clast trace element compositions do not match any carbonaceous chondrite, suggesting that the clast has a unique origin [3]. Here we report the mineralogy of the AOA in LEW 85300 and discuss the origin of the carbonaceous clast.

The AOA is cut by an impact melt vein. Half of the AOA shows impact-related recrystallization textures (euhedral pyroxene and molten metal/FeS), but the other part preserves the pre-impact textures and minerals: olivine, FeS and Mg,Al-phyllosilicate. Individual olivine grains measure 1-8 μm, with Fe-rich rims, probably due to impact heating.

Olivines in the AOA are highly forsteritic (Fo_{95-99}), indicating that the AOA escaped thermal metamorphism [4]. No LIME (Low-Fe, Mn-Enriched) olivine is observed, forsterite composition and the coexistence of Mg,Al- phyllosilicate suggest that the AOA is similar to those in the Bali-type oxidized CV (CV_{oxB}) and CR chondrites. However, fayalitic olivine, which commonly occurs in CV_{oxB} AOA, is not observed in this AOA. The small grain size (<8 μm) of olivine suggests the AOA may be related to CM or CO chondrites. We cannot exclude the possibility that the carbonaceous clast in LEW 85300 originated from a unique chondrite as suggested by [3]; but, the presence of the AOA indicates an affinity to existing carbonaceous chondrites.

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