An Amoeboid Olivine Aggregate in LEW 85300

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Introduction: 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 process and parent body alteration of their parent bodies [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 and major element compositions do not match any carbonaceous chondrite, suggesting they have a unique origin [3]. Here we characterize the mineralogy of AOA in LEW 85300 and discuss the origin of the carbonaceous clasts.

Results and Discussion: The AOA is located in an impact melt vein. Half of the aggregate shows recrystallization textures (euhedral pyroxene and molten metal/FeS) due to impact melting, but the remaining part preserves the original texture. The AOA is composed of 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 (Fo95-99), indicating that the AOA escaped thermal metamorphism [4]. Although 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 (CVoxB) and CR chondrites. However, it should be noted that fayalitic olivine, which commonly occurs in CVoxB AOA, is not observed in this AOA. Also, the smaller grain size (<8 μm) of olivine suggests they may be related to CM or CO chondrites. Therefore, we cannot exclude the possibility that the AOA originated from a unique carbonaceous chondrite as suggested by [3].

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