Petrography of a unique type A CAI evolved by multiple heating

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Calcium-aluminum-rich inclusions (CAIs) are the oldest solid materials in the early solar system (e.g., [1]). Although almost all CAIs has partially melted more than once (e.g., [2, 3, 4]), the petrography and isotopography considering the fractional crystallization with partial melting processes are limited. In this study, we try to estimate the crystallization history with petrography and trace elements mapping of wide area. The major elements mapping with FE-SEM-EDS (JSM-7001F and X-max 150) and the trace elements mapping with LA-ICP-MS (NWR193nm Laser and iCAPQ) at Kyoto University. A large perfect rounded shaped CAI, named KU-N-01 from NWA7865 CV3 chondrite, consists of about 80% melilite, and could be belong to compact type A CAIs. However, KU-N-01 has a bulk chemical compositions between type A and type B on the Stolper's diagram [5], since the KU-N-01 CAI has spinel-fassaite-rich area that is corresponding to the texture of type B CAIs. The trace elements mapping applied to the clear partial melting texture, which consists of fassaite, melilite with zoning of $Åk_{20}$ to $Åk_{70}$ and $Åk_{15\text{-}20}$ melilite. As results, the REEs excepting Eu are enriched in fassaite, whereas Eu is depleted. In contrast the REEs excepting Eu are depleted in the zoning melilite, whereas Eu is enriched. In $Åk_{15\text{-}20}$ melilite, all REEs are enriched. These results suggest that the area of fassaite and melilite with zoning are crystallized from the pocket of partially melted, however $Åk_{15\text{-}20}$ melilite are relict, since the REEs are enriched in the melt rather than that of other crystals without Eu. In this talk, through the survey with REEs broad area mapping, we will discuss about new perspective to estimate the partial melting history in CAI formation process.

[1] Connelly et al. (2012) *Science*, **338**, 651-655. [2] Yurimoto et al. (1998) *Science*, **282**, 1874-1877. [3] MacPherson and Davis (1993) *GCA*, **57**, 231-243. [4] Kawasaki et al. (2015) *GCA*, **169**, 99–114. [5] Stolper (1982) *GCA,* **46**, 2159–2180.