Al-Mg isotope distribution in Type B CAI: partial melting and chronology

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Introduction: Oxygen isotopic compositions are heterogeneously distributed within and between minerals in coarse-grained CAIs, suggesting crystallization from different generations of melt. These minerals often plot on a straight line or multiple lines on an Al-Mg isochron diagram. From petrographic and O isotopic study, these CAIs have experienced at least two partial melting events (e.g., Simon et al., 2005; Itoh et al., 2009). In the present study, we report preliminary results of Al-Mg isotopic measurements of spinel and melilite in Golfball and TS34 to estimate the reset for Al-Mg isotope system of the multiple melting events of each melt.

Results and discussion: Al-Mg isotope analyses were performed with a Cameca ims-1270 SIMS instrument at Hokkaido University. These analytical procedures are described in detail elsewhere.

Two isochrons are defined by the Al-Mg data for these CAIs. For Golfball, the gehlenitic core melilite and rim melilite yield different initial $^{26}\text{Al}/^{27}\text{Al}$ ratios of 4.9 (8) and 1.9 (12) x 10$^{-5}$, respectively. The age difference between the two isochrons is calculated to be about 1 My. For TS34, the spinel (through the origin) and the mantle melilite yield different initial $^{26}\text{Al}/^{27}\text{Al}$ ratios of 5.5 (4) and 4.5 (6) x 10$^{-5}$, respectively. The age difference between the two isochrons is calculated to be about 0.2 My. These results are consistent with the multiple crystallization history by the results of petrographic study.

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