An ion-microprobe study of Be-B systematics on CO and CH CAIs

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Beryllium-10, which decays to ^{10}B with a half life of 1.4 Myr [1], cannot be produced by stellar nucleosynthesis but by spallogenic reactions induced by galactic and/or stellar cosmic rays. Hence, signatures of the former presence of ^{10}Be in CAIs and other solar system meterials provide important clues to understand irradiation conditions in the early solar system.

In the present study, we conducted Be-B isotopic measurements using a NanoSIMS 50 (at AORI, Univ. of Tokyo) on refractory inclusions in primitive chondrites, Y81020 (CO3.05) and SaU290 (CH3). A melilite-rich CAI in Y81020 shows ^{10}B excesses which are correlated with Be/B, indicating the presence of ^{10}Be when the CAI formed. The inferred initial ^{10}Be/^{9}Be ratio of the CO CAI is comparable to those of CV CAIs [e.g., 2,3] within uncertainties, suggesting that the CO CAI experienced irradiation processes similar to CV CAIs. In contrast, a melilite-rich CAI in SaU290 shows no resolvable excesses in ^{10}B from the terrestrial abundance. Previous studies have demonstrated that ^{26}Al-poor CAIs (e.g., CM hibonite-rich CAIs and CV FUN inclusions) typically show low ^{10}Be/^{9}Be ratios than those of most normal CAIs [4,5]. The ^{26}Al-poor signature of these CAIs is interpreted as their formation prior to the injection of ^{26}Al in the solar system [e.g., 6]. These observations may suggest that ^{26}Al-poor CAIs record irradiation history in the protosolar molecular cloud [4,7] and/or heterogeneous distribution of ^{10}Be in the early solar system [5]. A substantial fraction of CH CAIs also has little ^{26}Al [e.g., 8], suggesting possible relationship to ^{26}Al-poor CAIs in CMs and CVs. The ^{10}Be-poor signature of the CH CAI observed in this study, therefore, support the above hypothesis.

[1] Korschinek et al. (2010) *Nucl. Instr. Methds Phys. Res.* **B268**, 187-191. [2] McKeegan et al. (2000) *Science* **289**, 1334-1337. [3] Sugiura et al. (2001) *Meteorit. Planet. Sci.* **36**, 1397-1408. [4] Wielandt et al. (2012) *ApJL* **748**, L25 (7pp). [5] Liu et al. (2010) *ApJL* **719**, L99-L103. [6] Sahijpal et al. (1998) *ApJ* **509**, L137-L140. [7] Desch et al. (2004) *ApJ* **602**, 528-542. [8] Krot et al. (2008) *ApJ* **672**, 713-721.