AN ION MICROPROBE STUDY OF BE-B ISOTOPE SYSTEMATICS IN MELILITE-RICH CAIS BASED ON NEWLY DETERMINED Be/B RELATIVE SENSITIVITY FACTORS FOR MELILITIC GLASS STANDARDS.

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Introduction: Beryllium-10, which decays to ^{10}B with a half-life of 1.4 Myr [1], is produced almost exclusively by spallation reactions induced by solar or galactic cosmic rays. Resent ion microprobe studies have demonstrated that CAIs in several types of carbonaceous chondrites record a wide range of initial ^{10}Be/^{9}Be ratios [2-4]. This suggests that variable irradiation processes and/or conditions have existed in the early solar system. However, in the ion microprobe analyses, a Be/B relative sensitivity factor (RSF) for a melilite composition has not been well established due to the absence of suitable standards. In order to overcome this problem, we synthesized glass standards with melilitic compositions with different Be/B ratios. Here we report preliminary results of RSF and Be-B systematics of melilite-rich CAIs in CO, CH, and ungrouped C chondrites.

Synthesis of glass standards with variable Be/B ratios: We synthesized three glasses with melilitic compositions, which were doped with Be and B with variable Be/B ratios. Their major element concentrations were determined using FE-EPMA (JEOL-8530F, The Univ. of Tokyo). Furthermore, Be concentrations were measured using LA-ICPMS (ICAP Q, The Univ. of Tokyo). Unfortunately, B concentrations could not be well determined at this time. In this abstract, therefore, we estimated B concentrations by SIMS (see below).

SIMS analysis: B concentrations and $^{9}Be^{+}/^{11}B^{+}$ ratios were determined by a NanoSIMS 50 at Atmosphere and Ocean Research Institute (AORI), The Univ. of Tokyo. A primary O^{-} beam of 1 nA was focused to ~5 μm in diameter and rastered over 10 x 10 μm^2. $^{9}Be^{+}$, $^{10}B^{+}$, $^{11}B^{+}$, $^{30}Si^{+}$, and $^{43}Ca^{+}$ ions were detected simultaneously in the multi-collection mode. B concentrations of synthetic glasses were estimated using $^{11}B^{+}/^{30}Si^{+}$ ratios in comparison with that of NIST 610 glass. Previous studies showed that matrix effects on the B sensitivity are small for minerals with diverse chemical compositions [5,6]. Therefore, in our preliminary results, we estimated B concentrations of synthetic glasses by SIMS measurements using NIST 610.

RSF: The RSF for melilite-like glasses was estimated using calibration curves determined from three melilite-like glasses with different Be/B ratios (^{9}Be/^{11}B ~7, 18, and 44). The RSF ($^{9}Be^{+}/^{11}B^{+}$)/(^{9}Be/^{11}B) is 2.36 ± 0.12 (2σ) in favor of Be ions relative to B ions. Under the same analytical condition, we also obtained the RSF for NIST 610 glass (2.73 ± 0.25; 2σ), which is ~16 % higher than that of melilite-like glasses.

Initial ^{10}Be/^{9}Be in melilite-rich CAIs: We also investigated Be-B systematics of melilite-rich CAIs in Y81020 (CO3.05), SaU290 (CH3), and Y82094 (ungrouped C3.2) chondrites using the NanoSIMS 50 at AORI. Melilites in Y81020 and Y82094 show excesses in ^{10}B and the inferred initial ^{10}Be/^{9}Be ratios ranged from 0.9 to 2.0 × 10^{-3}, slightly higher than those of CV CAIs (e.g., 0.88 × 10^{-3} [8]). If these CAIs formed contemporaneously, the variation in the ^{10}Be/^{9}Be ratio observed in this study supports ^{10}Be production by local irradiation processes [e.g., 4, 7]. Although analytical uncertainties are large, melilites in SaU290 have the inferred initial ^{10}Be/^{9}Be ratios ranged from 0.4 to 1.1 × 10^{-3}. Recently, Gounelle et al. [3] found that the highest initial ^{10}Be/^{9}Be ratio has been reported for an Isheyevo (CB/CH) CAI. Dunham et al. [4] found that the lowest one has been reported for a NWA5028 (CR2) CAI [4]. Given our and these previous results, CB, CH, and CR CAIs may represent more a wide range of initial ^{10}Be/^{9}Be ratios than CV CAIs.

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