Preliminary report on lead isotopic systematics of Martian meteorite Zagami

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Introduction:

Zagami, a geochemically-enriched shergottite, is the only Martian meteorite that consists of multiple lithologies with distinct initial Sr isotopic compositions [1-5]. The Sr isotopic variability suggests that Zagami has sampled more than two geochemical source reservoirs, which may include as-yet-unidentified ancient Martian crustal component. We report preliminary results of Pb isotope analyses of Zagami sawn dust that is expected to reflect a mixture of the multiple Zagami lithologies.

Experiment:

We performed a 5-step sequential acid leaching experiment after the method of [6]. We employed 30 mg of the Zagami sawn dust and obtained five leachates and the residue. Pb isotopic compositions and trace element abundances of the leachates and residue were determined by TIMS and ICP-MS, respectively.

Results and Discussion:

The residue exhibits a LREE-depleted pattern similar to Zagami pyroxene. A mass balance calculation based on the ICP-MS results indicates that the residue accounts for only 2% Pb in the whole Zagami sawn dust; i.e., the rest of 98% Pb was removed by the leaching experiment. These results strongly suggest that the Pb isotopic composition of the residue contain neither terrestrial nor Martian surface component but represent that of Zagami magma source(s). The Pb isotopic composition of the sawn-dust residue is distinctly more radiogenic than that of the coarse-grained lithology of Zagami [7]. This indicates that at least one of the other Zagami lithologies has more radiogenic Pb than the coarse-grained lithology. Our preliminary results, combined with the previous Sr isotope studies [2-5], suggest that multiple magmatic sources were involved in the Zagami petrogenesis, due most likely to the magma mixing and/or crustal assimilation.

[1] Niihara et al. 2012 *MAPS* **75**, #5075. [2] Nyquist et al. 1995. *LSPC*. **26**, 1065-1066. [3] Nyquist et al. 2006. *MAPS*. **41**, A135. [4] Nyquist et al. 2010. *MAPS* **45**, A154. [5] Misawa et al. *MAPS*. **75**, #5190 [6] Moriwaki et al. 2014 *LPSC* **45**, #1773. [7] Borg et al. 2005 *GCA*. **69**, 5819-5830.