

Gallium isotopic composition of GSJ rock reference samples

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Gallium (Ga) is a moderately volatile element with a 50 % condensation temperature of 968 K [1]. Compared to primitive meteorites and the Sun, which represents the Solar System elemental abundance, the bulk silicate Earth is depleted in volatile elements [2]. Gallium is enriched in iron meteorites [3] and partitions to the metal phase during metal/silicate partitioning experiments [4], so therefore can be assumed to have the characteristics of a siderophile element and was incorporated into the core during Earth formation. However, the overabundance of Ga compared to other siderophile elements with similar 50% condensation temperatures in the mantle and falling on the volatility trend suggests that it behaves as a lithophile element and this reason is not known. To fully understand the behaviour of Ga during Earth formation, Ga isotopic compositions of five Geological Survey of Japan (GSJ) rock reference samples were obtained.

Five GSJ rock reference igneous samples (JB-1b: basalt, JF-1: feldspar, JGb-1: gabbro, JG-1: granodiorite, JSy-1: syenite) were dissolved in HF + HNO₃ solution and Ga was purified by column chromatography [5]. Gallium concentrations were measured with an ICP-AES and Ga isotopes were analyzed using a Neptune MC-ICP-MS at Kochi Core Center, Japan. The $\delta^{71}\text{Ga}$ ($^{71}\text{Ga}/^{69}\text{Ga}$ permil deviation from an in-house standard) was analyzed at a precision of ~ 0.08 ‰ (2SD).

All samples had a similar Ga isotopic composition in the range of $\delta^{71}\text{Ga} = -0.03 \sim 0.08$ ‰ (average $\delta^{71}\text{Ga} = 0.04$ ‰, $n = 7$). The obtained values were in agreement within error with the Ga BSE value ($\delta^{71}\text{Ga} = 0.00 \pm 0.06$ ‰ [5]). This further demonstrates that isotopic fractionation of Ga does not occur during igneous processes.

[1] Lodders (2003), *Astrophys. J.* **591**, 1220–1247. [2] Drake & Righter (2002) *Nature* **416**, 39–44. [3] Wai & Wasson (1979) *Nature* **282** 790-793 [4] Blanchard *et al.* (2015) *Earth Planet. Sci. Lett.* **427**, 191–201. [5] Kato *et al.* (2017) *Chem. Geol.* **448**, 164–172.