High precision Cr-Ti stable isotope measurements for the extra-terrestrial materials.

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Chromium-54 and titanium-50 anomalies in extra-terrestrial materials are interpreted to reflect nucleosynthetic heterogeneities. The combination of these two isotope systems provides important information about the genetic relationship between planetary materials. Here, we report a sequential chemical separation procedure for high-precision Cr and Ti isotopic ratio measurements of extra-terrestrial rocks. The procedure comprises four steps: (i) Fe removal using AG1-X8 anion exchange resin; (ii) matrix elements removal using AG50W-X8 cation exchange resin; (iii) Cr and Ti separation and Cr purification using AG50W-X8 cation exchange resin; (iv) Ti purification using TODGA resin.

We applied this method to a standard basalt (JB-1b; 15-50 mg) and Juvinas (~20 mg) non-cumulate eucrite. We found that the problematic elements causing isobaric interferences were sufficiently removed: $^{56}Fe/^{52}Cr$, $^{51}V/^{52}Cr$ and $^{49}Ti/^{52}Cr$ in Cr fraction were as low as 7×10^{-6}, 8×10^{-8} and 4×10^{-7}, respectively. We have measured Cr stable isotope compositions of the silicate samples processed through the new separation scheme by thermal ionization mass spectrometry (TIMS). The Cr stable isotope analyses yielded $\varepsilon^{54}Cr = 0.16 \pm 0.22$ (2SE) for JB-1b and $\varepsilon^{54}Cr = -0.48 \pm 0.25$ (2SE) for Juvinas. These results are consistent with the previously reported values [1,2], indicating the reliability of the method. The sequential chemical separation scheme developed here allows us to extract Cr and Ti from basaltic samples with fewer steps than those in the previous study [e.g., 3,4]. We will apply the method to various extra-terrestrial materials for better understanding of the origin and early evolution of the solar system.

[1] Qin et al. (2010) *GCA* **74** 1122-1145, [2] Trinquier et al. (2007) *ApJ* **655** 1179-1185, [3] Zhang et al. (2011) *JAAS* **26** 2197-2205, [4] Schiller et al. (2014) *JAAS* **29** 14 06-1416.