High-precision stable Cr isotope analysis of geological materials by double spike TIMS method

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This study has led to new techniques for separation of Cr from terrestrial materials with a considerable range of chromium contents and for precise analysis of stable Cr isotope ratios by double spike thermal ionization mass spectrometry (TIMS). Separation of Cr from a matrix was commonly achieved by two or more columns with oxidizing reagents in literature [1, 2]. In this study, an improved two-column separation procedure without oxidizing reagent is introduced. This chemical separation process reduces the risk of contamination during laboratory procedures and the procedural blank is less than 4 ng. Due to the inhibition of the ^{52}Cr signal intensity by organic matter from the resin, removal of organic residues from samples prior to filament loading program is necessary [3, 4]. Here perchloric acid is utilized to eliminate organic matter interference from resin. The chemical shifts in Cr isotope ratios and instrumental mass bias effects are corrected by a ^{50}Cr–^{54}Cr double spike method.

Long-term reproducibilities for δ^{53}Cr of NIST SRM 987 and NIST SRM 3112a are ± 0.017‰ (2SD) and ± 0.025‰ (2SD), respectively. Replicate digestions and analyses of international standards yield δ^{53}Cr values of basalts BHVO-2 (–0.129 ± 0.032‰, 2SD) and BHVO-1 (–0.120 ± 0.029‰, 2SD), peridotite JP-1 (–0.088 ± 0.034‰, 2SD), andesite AGV-2 (–0.051 ± 0.031‰), and granodiorite GSP-2 (–0.075 ± 0.049‰, 2SD).

[1] Schoenberg *et al.* (2008) *CG* **249,** 294-306. [2] Frei *et al.* (2009) *Nature* **461,** 250-253. [3] Qin *et al.* (2010) *GCA* **74,** 1122-1145. [4] Johnson & Bullen (2004) *Elsevier B.V.* **2004,** 623-651.