Development of single-step column separation method for Hf and Nd isotopic analyses of geological materials

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Neodymium (Nd) and hafnium (Hf) isotopic ratios are indispensable tracers in geochemistry. In this contribution, we present a routinely applicable method for the single-stage isolation of Nd and Hf from geological samples, a fit-for-purpose procedure for multi-collector ICP-mass spectrometric (MC-ICP-MS) analysis.

Sample digestion: ~100 mg of rock powder was dissolved with HF, HNO_3, and $HClO_4$. After evaporation, sample was re-dissolved in 1 mL 0.2 M HCl. After centrifuging, 0.1 mL sample solution was loaded onto the separation column; thus 10 mg sample was used for separation.

Chemical separation: The chemical separation technique is a one-step ion chromatography based on the modification of previously described techniques using Ln-spec resins from Eichrom Technologies (USA) [1, 2, 3, and 4]. Ln-spec resin was packed into the column (a resin volume of 1 mL with a reservoir of ~8 mL). After sample solution loading, major ions and the other LREEs were subsequently eluted with 0.2 M HCl and the Nd fraction was then eluted (collected). 6 M HCl was brought onto the column to elute Sm and HREE. Mixed acid (2 M HCl-0.1 M HF) eluted Ti, Nb, Ta and Zr. Finally, the Hf fraction was eluted (collected) with mixed acid (2 M HCl-0.2 M HF). The Nd and Hf fractions were evaporated to dryness and finally taken up in 1 mL of 0.3 M HNO_3. *Neptune Plus* MC-ICP-MS was used with a desolvator for isotopic measurement. The usefulness of our procedure was assessed by analyzing of USGS and GSJ standard rock samples. All results obtained using our analytical protocol agreed well with the reference values. Compared to previously reported procedures, this method reduces costs and laboratory time without compromising accuracy or precision of subsequent MC-ICP-MS analyses.

[1] Münker *et al*. (2001) *G-cube*, GC000183. [2] Shinjo *et al*. (2010) *J Mineral Petrol Sci*, **105**, 297-302. [3] Scher and Delaney (2010) *Chem Geol*, **269**, 329-338. [4] Huang *et al*. (2012) *JAAS*, **27**, 1560-1567.