Matrix dependent elution behavior of Ti, Al, and Cr in cation resin

JIAN-XIONG.MA[12], JIN.LI[12], XIANG-KUN.ZHU[12]

[1] Key Laboratory of Deep-Earth Dynamics of Ministry of Natural Resources, Institute of Geology, Chinese Academy of Geological Sciences, Beijing 100037, China majx@cags.ac.cn lijin80119@hotmail.com xiangkun@cags.ac.cn

[2] MNR Key Laboratory of Isotope Geology, Institute of Geology, Chinese Academy of Geological Sciences, Beijing 100037,China

High precise measurement of Cr isotope by the MC-ICP-MS or TIMS requires purification of Cr from the sample matrix. The cation resin AG50W-X8 can be utilized to separate Cr efficiently with a low blank. The elution behavior of the elements in the resin is controlled by the distribution coefficient between the elements and the resin. This study found that the elution behaviors of Ti, Al, and Cr are highly dependent on the matrix of the samples as well as the distribution coefficient. For example, theoretically, the adsorbability of Cr, Ti, Al on the resin with 1N HCl acid is in the order of Al^{3+}>Ti^{4+}>$[CrCl2]^{+}$>$[CrCl]^{2+}$. Ti is eluted following the elution of $[CrCl]^{2+}$ and $[CrCl_2]^{+}$ in 1mol/L HCl, and Al is eluted in 6mol/L HCl for the dunite samples. However, for the shale samples, Ti is eluted together with Cr at the very beginning and Al is eluted with a long tail throughout the whole purification procedure. The shale contains hundreds ppm of sulfur, which would transform to SO_4^{2-} during the sample digestion. The presence of SO_4^{2-} may decrease the adsorbability of Ti with the cation resin or form an unexpected complex compound, which makes Ti is eluted from the cation resin together with Cr. The shale is a kind of high Al but low Cr geological sample, which add the risk of the overloading effect of Al. In HF medium, Ti form a complex of TiF_6^{2-} , Al form a anionic species as AlF_4^{-} or AlF_6^{3-} and Trivalent Cr does not form anionic fluorine complex. Hence, the residual Cr can be separated with Al and Ti by diluted hydrofluoric acid in a secondary column.