Evaluation of a Method for the Separation of Ni in Geological Samples

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The distribution of Ni in geological materials is controlled by a number of key processes depending on the geological context: these include partial melting for mantle materials and mantle-derived magmas, and shallow fluid-related processes during ore-body genesis. The measurement of the stable isotopes of Ni could provide data that may be useful to understand these processes and for geochemical fingerprinting. So far this has been hampered by the lack of a reliable and simple separation technique to produce high-purity Ni solutions. We have undertaken development of a separation technique to separate Ni from rock matrices to measure Ni isotopes by plasma source mass spectrometry.

Tests show that Ni can be isolated from geological materials using a simple two-column procedure. An Icelandic basalt, BIR-1, was digested and used during the development of this method. The sample was first passed through Biorad anion exchange resin AG MP1-M in HCl form in order to remove the Fe and Cu from the sample. The Ni is eluted with the bulk matrix elements and 100% of the Cu and Fe are retained on the column. The sample fraction containing the Ni and matrix elements was then passed through Eichrom Ni specific resin in an HCl and ammonium citrate solution with a pH of 8-9. The Ni in the form of a dimethylglyoxime complex was stripped with 3M HNO_3. It was found that the preliminary removal of Fe and Cu is essential, as these elements are eluted with Ni and would prove to be a problem during subsequent isotope analysis.

Multi-elemental scans of sample solutions on an Agilient 7500CS quadropole ICPMS revealed the Ni is isolated from matrix elements using this protocol. The proposed method provides a 95± 2% recovery of Ni. Continuing refinement for this method relevant to different types of geological samples is in progress.