Refining B separation protocols for silicate rock samples and probing mantle composition using B isotopes

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Recycling of lithospheric fragments influences the chemical evolution of Earth's mantle, by addition of distinctive, surface-processed material. The addition components with isotopically anomalous boron via the subduction process is a notable example. Despite the potential of this system, resolution of significant differences in $\delta^{11}B$ within the mantle remains hampered by poor precision and questions over accuracy of silicate analyses. The precise determination of the B isotopic composition of whole rock or volcanic glass specimen is challenging due to B volatility during traditional chemical processing, low abundances and high analytical blanks, and difficulty in controlling isntrumental fractionation during analysis. The latter problem is now well controlled using multi-collector plasma mass-spectrometery and standard procedures allow blanks to be controlled. Reliable processing of silicate samples still poses problems. We present B isotopic data obtained from well characterised reference material (JB-2 Basalt, $\delta^{11}B$ 6.7-7.7, 30.2 ppm B) which has been processed by protocols involving flux fusion at relatively high (>750°C, Sodiumydroxide) and moderate (400°C, Sodiumperoxide) temperatures, dissolution by addition of concentrated acids (HF) and controlled stepwise dissolution where HF is added and neutralized directly after dissolution. The B is separated by ion exchange chromatography using the Amberlyte IR 743 resin. We will compare the different approaches to rock fusion/dissolution in terms of B recovery, procedural blanks and potential isotope fractionation. Experiments with HF and Sodiumhydroxide dissolution have good B yields (99.0 and 91.7% respectively), albeit not quantiative using Sodiumhydroxide as a flux. Finally, we will present B isotopic data obtained from volcanic glass to investigate the B isotope composition of the earths mantle by Multi Collector - Inductively Coupled Plasma – Mass Spectrometry. The glasses from those samples will further be analysed for their major, trace and rare earth element composition, to validate their mantle origin and to probe for potential surface interaction with modern day seawater.