Determination of Boron using Isotope dilution MC-ICP-MS

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A new technology applying to the isotope dilution method was used to estimate the amount of B(boron) in geological samples and was determined to be a viable method to minimize naturally occurring B background signals. The B ratios in geological sample (SDC-1 and SGR-1) were measured using a double-focusing multiple collector inductively coupled plasma mass spectrometer (Neptune). High naturally occurring B background signals and $^{40}Ar^{+4}$ interference were improved using a low RF power technique. A H_3PO_4 in mixed acid (HNO_3 + HF) was used to reduce the loss of B form (BF_3) in the sample dissolution process.

Boron isotopes were measured using a multi-collector, inductively coupled plasma mass spectrometer (Neptune, Thermo-Finnigan, Bremen, Germany).The present study determined an alternative method to minimize B isotope background signals. The B background signal was improved using a low RF power technique. The 800 W setting represents an excellent compromise between lower interference and the reduced matrix effect experienced at 1200 W. The results at 800 W (SGR: 55.246 ± 0.003 and SDC: 13.273 ± 0.003 mg g-1) were equivalent to the reference values (SGR: 54 ± 3 and SDC: 13 mg g-1). However, the values obtained using 1200 W (SGR: 48.600 ± 0.001 and SDC: 11.127 ± 0.004 mg g-1) were slightly lower than the 800 W values. Furthermore, the addition of H_3PO_4 prevented the loss of boron within the sample dissolution process. The SDC-1 and SGR-1 results obtained by the isotope dilution method were within the range of the reference values. Overall, the high performance of our proposed analytical technique (decreased B background signal under low RF power, H_3PO_4, isotope dilution method and MC-ICP-MS) makes it suitable for use in the determination of B in geological samples

1. J. K. Aggarwal, D. Sheppard, K. Mezger and E. Pernicka, *Chem. Geol.,* 2003, **199**, 331-342. 2. L. Zhao, Q. Chen, C. Li and G. Shi, *Sol. Energy Mater. Sol. Cells,* 2007, **91**, 1811-1815. 3. T. Fujisakia, A. Yamadab and M. Konagai, *Sol. Energy Mater. Sol. Cells,* 2002, **74**, 331-337. 4. M. Betti, *Int. J. Mass Spectrom.*, 2005, **242**, 169-182.

Boron and other trace element constraints on the slab-derived component in Miocene volcanic rocks from the Setouchi Volcanic Belt in SW Japan

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We present a dataset for boron and other trace element contents for basalts and high-Mg andesites (HMA) obtained from the middle Miocene Setouchi Volcanic Belt (SVB) in SW Japan. SVB was formed along the SW Japan Arc, immediately after the opening of the Japan Sea and clockwise rotation of SW Japan with the subduction of young hence hot Shikoku Basin of the Philippine Sea plate. Previous studies on HMA and basalt of SVB, laid stress on the contribution of subducting sediment, particularly partial melt of terrigenous sediments to the magma source mainly based on their Sr, Nd, Pb isotopic compositions.

Analyzed samples show a large negative Nb and Ta anomalies, and enrichment of alkaline earth elements and Pb, which are features of typical island arc volcanic rocks. Boron content of basalts and HMA is highly variable (7 – 71 ppm).

Trace element compositions of altered oceanic crust-derived fluid, sediment-derived fluid, and sediment melt are modeled, and resultant fluid mobile/immobile element ratios (B/Nb, Ba/Nb, Pb/Nb, and K/Nb) are used to examine slab-derived component to mantle source. Most of element ratios are explained by <5% contamination of sediment melt to depleted mantle except for some HMAs with rather high B/Na ratios. Mantle source for these HMAs may be enriched with some trace elements including boron before the addition of slab-derived melt.

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