Determination of true boron isotope compositions of silicate glasses by SIMS: NIST SRM glasses and composition-induced variations in SIMS instrumental mass fractionation

Rosner, Martin[1] Wiedenbeck, Michael[2] Ludwig, Thomas[3]
[1]Federal Institute for Materials Research and Testing [2]GeoForschungsZentrum Potsdam, Section 4.2 Inorganic and Isotope Geochemistry [3]University of Heidelberg, Institute of Mineralogy

Over the past several years SIMS has become a commonly used method for the *in situ* determination of boron (B) isotope compositions of glasses and mineral phases. However, the lack of appropriate reference materials with natural basaltic to rhyolitic compositions continues to hamper the accurate B isotope analysis by SIMS.
To test for the presence of systematic shifts in instrumental mass fractionation (IMF) related to differences in major element compositions, a series of widely distributed and commonly used glass reference materials were analyzed for their B isotope ratios by SIMS. As NIST SRM 610 and 612 glasses are popular glass reference materials and because they are also well characterized for their B isotope systematics, our study compares the performance of the two NIST glasses to three other homogeneous, well distributed glass reference materials (B6, StHs6/80-G, JB-2 re-melted) which have “geologic” major element compositions.
Our B isotope data reveal that a systematic analytical offset of about 3.4‰ exists within this data set between the two NIST SRM glasses, on the one hand, and the three natural-geological glasses, on the other. As IMF of the natural glasses overlap within error (1.6‰ 2SD), we suggest that no significant matrix effect exists among natural basaltic to rhyolitic compositions. In order to confirm the existence of a compositionally induced variation in boron SIMS IMF between NIST SRM and the natural-geologic glasses, the observed offset in IMF has been independently reproduced in two laboratories. This phenomenon has been found to be stable over a period in excess of one year.
For an accurate correction of the SIMS IMF both the single RM as well as the calibration curve approaches using natural basaltic to rhyolitic glasses appear to be reliable. Despite the difference in IMF between NIST SRM and the natural-geologic glasses, the NIST SRM suite of glasses remain among the best materials to assess the repeatability and accuracy of SIMS B isotope data as they are commercially available, widely distributed and have been documented to be homogeneous in their B isotope composition. Moreover, based on the apparently quite stable offset in IMF between NIST SRM 610 and 612 and natural glasses a correction for IMF determined the NIST glasses and taking into account the 3.4‰ matrix effect appears feasible. Based on our extensive data set, and in view of the observed matrix effect, an overall 2SD uncertainty for SIMS B isotope data of natural glasses (10-200 ppm B) of about 2‰ appears to be achievable with a small geometry SIMS instrument.

→

Abs. No. **474**
Meeting: **DMG 2008**
submitted by: **Rosner, Martin**
email: **martin.rosner@bam.de**
date: **0000-00-00**
Req. presentation: **Poster**
Req. session: **S10**