

## Light Lithophile Elements (Li, Be and B) determination by laser ablation - ICP-SFMS

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The importance of Light Lithophile Elements (LLE; namely Li, Be, B) is continuously increasing in the modern geochemistry. Their in-situ determination is currently carried out by secondary ion mass spectrometry (SIMS). However, due to the presence of significant matrix effects, the accurate quantification of LLE by SIMS requires valuable calibration curves determined on appropriate external standards (e.g. Ottolini & Hawthorne, 1999). Given that sampling and ionisation processes are physically separated in laser ablation (LA)-ICP-MS technique, the relevance of matrix effects is strongly reduced with respect to SIMS. Nevertheless, LLE determination by LA-ICP-MS at trace and ultra-trace level is commonly hampered by the poor sensitivity of this technique for the elements with low atomic number. Sector field ICP-MS have been recently demonstrated suitable to be coupled to laser ablation microprobe (Latham and Günther, 2002) and thanks to the high sensitivity of this kind of ICP-MS the low region of the mass spectrum can be investigated. Thus, we developed an analytical protocol dedicated to the accurate LLE determination by laser microprobe. The instrument couples a sector field ICP-MS Element I (ThermoFinnigan), adopting the fast field regulator (fast scanning) of the Element II, with a 266 nm laser microprobe. The masses of <sup>6</sup>Li, <sup>7</sup>Li, <sup>9</sup>Be, <sup>11</sup>B, <sup>25</sup>Mg and <sup>44</sup>Ca have been acquired in low resolution (M/ΔM~300) in order to have the maximum sensitivity conditions. At this mass resolution, the <sup>28</sup>Si<sup>4+</sup> is well-resolved from <sup>7</sup>Li<sup>+</sup>, whereas the removing of the isobaric interference of <sup>27</sup>Al<sup>3+</sup> on <sup>9</sup>Be<sup>+</sup> requires the reduction of the integration window of the peak. The analytical method have been tested on NIST (SRM 612, 614 and 616) and other selected MPI-DING glasses, with Li, Be and B contents in the range of hundreds of ppb to tens of ppm and very different major element composition. NIST SRM 610 has been used as external standard and <sup>44</sup>Ca as internal standard. Results indicate that using a spot size of 40 μm detection limits down to the 10 to 100 ppb level can be commonly obtained for Li, Be and B; concentrations lower than 1 ppm can be determined with an accuracy better than 20%.

### References

- Latham C. and Günther D. (2002), *J. Anal. At. Spectrom.* 17, 1-8.  
Ottolini L. and Hawthorne F. (1999), *Eur. J. Mineral.*, 11, 679-690.

## Ion Microprobe studies of Siberian diamonds with variable growth structures

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Using an ion microprobe technique variations in both C isotope composition and N content with detailed growth structure have been studied. Occasional diamonds show the highly complex growth histories illustrated by CL in which sector growth (with both cuboid and octahedral sectors) and change of crystal habit (from cuboid to octahedron) may be seen. Ion microprobe analysis of cuboid and octahedral sectors for diamond does not show any differences both in C isotope composition and N content. No differences between growth sectors are found in N content and aggregation state examined with FTIR spectroscopy. These results provide direct evidence of the absence of fractionation of C isotopes between cuboid and octahedral sectors growing simultaneously. This result is in marked contrast to the widespread supposition that carbon isotopes are fractionated during the different growth mechanisms.

On the other hand significant variations in δ<sup>13</sup>C and nitrogen abundance have been determined for zoned diamonds with the change of crystal shape from cuboid to octahedron during sequential growth. The CL reveals that the re-shaping of diamonds occurs via generation of numerous octahedral apices on cuboid surfaces and subsequent gradual transformation morphology to a regular octahedron. In several studied cases the cuboid core has lighter C isotope composition than the surrounding region of octahedral growth. The values of δ<sup>13</sup>C change towards the basic mantle C isotope signatures (-5.5‰). The N content decreases with the growth change from cuboid to octahedral modes. Nitrogen aggregation states in both parts of the studied diamonds suggest their long residence time under mantle conditions. No significant time gap in growth has been observed from the analysis of FTIR spectra. The variations in δ<sup>13</sup>C may be attributed to either different source of carbon for cuboid and octahedral parts or fractionation effect during diamond growth at least for several permil. However sequential may occur with little fractionation. Moreover the variation in 10‰ observed in one sample is a very large one to explain other than by involving of subducted source containing organic carbon of crustal origin.