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## Secondary Ion Mass Spectrometry Analyses of Diamond and Moissanite in Ophiolite

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### 1 Abstract

The Cameca 1280-HR large geometry SIMS instrument is a highly versatile analytical tool which can support a broad range of geochemical applications. Research using the Potsdam 1280 instrument focuses primarily on isotope ratio determinations in geomaterials. Optimized measurement protocols have already been established for  $\delta^{18}\text{O}$  determinations in zircon, and we are also working towards routine oxygen isotope determinations for quartz, calcite, mica, apatite and titanite. The primary challenge in developing such measurement systems are the identification and characterization of suitable reference materials (RMs), and this is made particularly challenging due to the matrix dependent ion yields of the SIMS ion source.

Here we wish to report our progress towards establishing new analytical protocols for the determination of  $\delta^{13}\text{C}$  in both diamond and moissanite. In the case of diamond, our facility possesses three natural RMs with which we are able to produce data with a typical analytical repeatability of  $\sim 0.15\text{‰}$  (1sd). An inter-comparison of our three diamond RMs demonstrates an overall data quality of better than 0.5‰ in terms of systematic offset between the various materials characterized using gas source mass spectrometry (Palot et al., 2012). A single such  $\delta^{13}\text{C}$  determination in diamond requires 80 s of data acquisition and involves a test portion mass of  $\sim 400$  pg

of material. In-house diamond reference materials for  $\delta^{15}\text{N}$  calibration allow us to measure this isotopic system to a total analytical uncertainty of  $\pm 1.6\text{‰}$  (1sd) at nitrogen concentrations reaching down to 250  $\mu\text{g/g}$ . Due to the relatively low abundance of nitrogen in diamonds, such isotope ratio determinations require around 9 minutes of data collection.

With respect to  $\delta^{13}\text{C}$  determinations in moissanite, we use a kimberlitic SiC as calibrant (Mathez et al., 1995), on which we achieve a repeatability of  $\sim 0.2\text{‰}$  (1sd) on a  $\sim 350$  pg test portion mass. Total data acquisition time for such measurements is 80 s. We are currently in the process of developing a second moissanite RM based on a synthetic, coarse-grained powder. We will also investigate this new material for its  $\delta^{30}\text{Si}$  characteristics.

### References

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