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Measuring oxygen isotopes in micrometeorites using SHRIMP

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Triple-oxygen isotope data are a powerful tool to identify the parent bodies of micrometeorites (MMs) [e.g., 1]. Secondary Ion Mass Spectrometry (SIMS) [2,3,4] and Laser Fluorination coupled with Isotope Ratio Mass Spectrometry (LF-IRMS) [1,5] are usually used. SIMS is non-destructive, generally offers quick acquisition and previously offered limited precision on the mass independent component $\Delta^{17}O$ (~0.5‰). Conversely, LF-IRMS provides high-precision data (~0.1‰ for $\Delta^{17}O$), but is totally destructive and time consuming. Here, we return to SIMS oxygen isotope acquisition using the new Sensitive High-mass Resolution Ion Micro Probe - Stable Isotope (SHRIMP-SI) using previously described methods for olivine [6]. This technique has the advantage of offering intermediate precision (~0.15‰ for $\Delta^{17}O$ on San Carlos olivine, 2 S.D.), fast acquisition time and is semi-destructive. A set of 53 S-type cosmic spherules (CSs) from Miller Butte, Northern Victoria Land, Antarctica, were analysed and measurements on CSs from the Antarctic Sør Rondane Mountains, Queen Maud Land, are ongoing. Preliminary results suggest that despite the analytical area being a mixture of olivine, glass, and rare magnetite, there is no significant bias on $\delta^{18}O$ induced by matrix effects. Data are consistent with those of previous studies using LF-IRMS. Thus, SHRIMP is a highly efficient technique to acquire relatively high-precision oxygen isotope signatures of MMs.

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