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Matrix independent and interference free in situ boron isotope analysis by laser ablation MC-ICP-MS/MS

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Boron isotope analysis has a wide variety of applications in the Earth and Planetary Sciences, including the analysis of marine carbonates as a pH proxy for seawater in studies concerned with both ocean acidification and reconstructing past variations in atmospheric CO_2. Laser ablation multi-collector inductively coupled plasma mass spectrometry (LA-MC-ICP-MS) has the potential to perform in situ analysis to characterise small scale heterogeneity and/or remove the need for chemical pretreatment. However, a number of studies have shown this approach suffers in terms of both accuracy and reproducibility due to a combination of spectral baseline interferences and mass-load induced bias, particularly when samples and standards are not matrix matched.

Here we investigate the use of a Thermo Scientific Neoma MS/MS MC-ICP mass spectrometer in full transmission mode to: 1) explore the potential of prefilter technology to remove spectral baseline interferences, and 2) assess its potential for accurate and precise determination of boron isotope ratios when coupled to a nanosecond laser ablation system. Through analyses of 14 carbonate and silicate reference materials with known B contents and $\delta^{11}B$, we demonstrate that accuracy and reproducibility to within 1‰ is achieved without matrix-matching samples and standards, and that a key factor behind the success of this approach is the functionality of the instrument's pre-filter technology.