Self-Induced Matrix Effects in MC-ICP-MS

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Multi-collector inductively coupled plasma mass spectrometers (MC-ICP-MS) can measure isotope ratios with high precision for a wide range of elements and materials. The measured ratios always undergo mass fractionation caused by processes inherent to MC-ICP-MS. Generally, calibration methods such as double spiking or/and standard-sample bracketing (SSB) in combination with the application of fractionation laws, can correct for these offsets. However, some of the processes that cause mass bias are still poorly understood, rendering commonly used correction methods incomplete. Self-induced matrix effects, whereby the sensitivity of an analyte decreases as the mass to charge ratio of an element increases [1], are oberved when sample concentrations do not match that of the bracketing standard [2,3]. This phenomenon is present even when analysing single element, matrix-free solutions, and deteriorates the efficiency of applying SSB for mass bias correction.

We characterised self-induced matrix effects for several elements (Fe, Nd, Hf, Mg, Zn, Li), and observed this phenomenon only in dry plasma mode (Figure 1), suggesting that desolvation sample introduction systems introduce this fractionation. Experiments with Fe in various geological reference materials show a higher variability of δ^{56}Fe than when using matrix-free Fe solutions at the same relative concentration. This suggests there is a superimposed mass bias from the matrix elements. This data set will be used to design a matrix-based correction protocol for mass fractionation caused by concentration offsets.

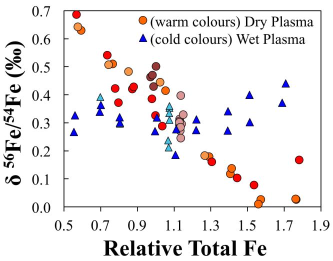

Figure 1 δ ^{56}Fe over a range of relative sample/standard Fe concentrations

[1] Olivares & Houk (1986), *Anal. Chem.* 58, 20-25 [2] Andrén *et al.* (2004), *J. Anal. Atom. Spectrom.* 19, 1217-1224 [3] Malinovsky *et al.* (2003), *J. Anal. Atom. Spectrom* 18, 687-69