Trace Element Analysis of High Matrix Samples Using Flow Injection ICP-MS

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A significant barrier when using ICP-MS for trace element analysis is its intolerance for sample solutions containing high total dissolved solids (TDS). In Geochemical Research there is an ever-increasing demand to measure many trace/ ultra-trace elements in matrices that are rich in other major inorganic and organic constituents. ICP-MS is the gold standard for trace elemental analysis, with its ability to harness superior detection limits, measure accurately over wide linear working ranges and to perform rapid multi-element scanning. However, in order to ensure that the ICP-MS instrument delivers data with acceptable precision and accuracy it is widely accepted that the TDS concentrations in measured samples should be below 2000ppm in order to avoid un-wanted drift and loss of signal. There is the conventional option to dilute the samples so that they are below the 2000ppm limit, although even with the excellent detection power of ICP-MS the reduction in the amount of analyte reaching the plasma often renders many trace elements undetectable. Also, manual dilution is time consuming, open to error and prone to contamination. In this poster we present a novel approach to handle the direct trace element measurement of high TDS meteorite digest samples, using a five syringe solution delivery and mixing system. The system comprises two valve injection units; the first delivers the addition of internal standard and an in-line dilution; the second valve then triggers and actuates a small injection of sample material into the ICP-MS that is measured as peaks on a time scale. The timing of the actuations can be altered to account for the concentration of TDS; small time intervals for high TDS and larger time intervals for lower TDS, in order to minimise plasma quenching. We will present the system configuration, explain the automation and present results from meteorite digests with differing TDS concentrations to measure an array of trace elements.