



Evaluation of high resolution magnetic sector ICP-MS for REE determinations in complex water samples

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Although the robust ICP is capable of ionizing elements with ionization potentials less than that of Ar, REEs combine with other species in the plasma to create stable and meta-stable molecular species which are transmitted into the mass analyzer along with REE⁺. These surviving polyatomic ions derived from the sample, preparation reagents and entrained atmospheric gases, interfere with REE analytes, resulting in the degradation of detection limits. In this study we evaluated a high resolution (HR) magnetic sector ICP-MS (Element 2, ThermoFisher Scientific, Bremen, Germany) for determination of very low diagnostic REE concentrations in surface, subsurface and waste waters from Taiwan. This instrument provides variable resolving power from 300 to 10000, so that REE analyte isotopes could be resolved from REE and Ba molecular species and quantitative REE determinations could be made. The enhanced sensitivity and low background (1G CPS/ppb and <0.5 cts/s, respectively) giving rise to excellent detection limits (< 1 ppq), was further enhanced by using an ARIDUS desolvating sample introduction system incorporating a TEFLONTM microconcentric nebulizer and a heated PTFE spray chamber and microporous tubular membrane. Matrix induced interference effects were evaluated as a function of plasma ionization efficiency and Ca and Na concentrations. A comparison was made between the MCN and ARIDUS systems using LODS, calibration range and linearity, memory effects, % oxide formation, matrix effects and long term variations. Several internal standards were employed to compensate for signal suppression. Accuracy was determined by analyzing spiked water and diluted sea water samples and CRMs. It is concluded that such performance is an advantage for determination of diagnostic REE markers in environmental and geological samples.