Abstract:

The goal of the project is the development of simple ways to improve the analytical performance of Inductively Coupled Plasma Spectrometry (ICP-MS/OES) for the analysis of geological and environmental samples, in collaboration with ACME Analytical Labs (Vancouver, BC). The work to be presented entails the optimization of an argon-nitrogen-hydrogen mixed gas plasma method for the reduction of matrix interferences without sacrificing detection limits and plasma robustness. It is a continuation of the work published by C. Agatemor and D. Beauchemin (2010), examining the addition of ultra-high purity nitrogen to the outer plasma gas of an argon ICP, to improve robustness. Hydrogen sheath gas flows are adjusted using multivariate optimization, to increase the energy transfer from bulk mixed gas plasma to the central channel. Multi-element standard solutions, with and without a 0.1 M sodium matrix, are used for the multivariate optimizations. The beneficial sheathing effect of hydrogen in these mixed gas systems will be compared to conventional all argon ICP systems, in terms of detection limits and the reduction of matrix interferences. The superior performance of the mixed-gas plasma method in the automated analysis of a wide variety of geological and environmental certified reference materials, at ACME facilities, will also be shown. Finally, empirical investigations into an analogous response factor to the Mg II/Mg I ratio, indicative of plasma robustness, for ICP-MS will be presented.