

Evaluation of Electrochemically Modulated Separations Coupled On-line with Time-Of-Flight ICP-MS

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Electrochemically modulated separations have been employed on-line with inductively coupled plasma mass spectrometry (EMS-ICP-MS) to effect rapid and redox-selective separation, concentration, and detection of analytes from a variety of matrices including seawater [1-3]. EMS is based on the ability to control the affinity of a target surface for an analyte based on the potential applied to that surface. In short, analyte affinity is turned "on" and "off" via an applied potential. EMS involves a two-step process — accumulation and release — that is similar in many respects to electrochemical stripping analysis though current detection is not necessarily involved. Once released from the target electrode, the analyte is released into a clean solvent (e.g., dilute nitric acid) that is directed to the ICP-MS (salts are sent to waste during deposition).

EMS allows highly selective and rapid separations and analysis when employed on-line with ICP-MS. EMS also boasts very large signal enhancements (>100) while simultaneously avoiding typical ten-fold sample dilutions required to reduce the concentration of dissolved solids. EMS is a flow-injection technique that results in a transient signal (~ 10s). Preliminary evaluations of EMS coupled to an orthogonal acceleration time-of-flight mass analyzer are presented for elemental and isotopic analysis. It will be shown that the rapid spectral accumulation (30,000/s) and full elemental coverage are ideally suited for EMS development and multielement and isotopic analysis.

Literature:

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[3] J.R. Pretty, D.C. Duckworth, G.J. Van Berkel, "Anodic Stripping Voltammetry Coupled On-Line with Inductively Coupled Plasma Mass Spectrometry: Optimization of a Thin-Layer Flow Cell System for Analyte Signal Enhancement," *Anal. Chem.*, **69**, 3544 (1997).

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