

Analytical Approaches for Investigating the Function of Elemental Species in Biological Systems

Spiros A. Pergantis

Environmental Chemical Processes Laboratory, Department of Chemistry, University of Crete, Voutes Campus, Heraklion 71003, Crete, Greece
spergantis@chemistry.uoc.gr

Information about the function of metals and metalloids is currently obtained through a series of elemental speciation analysis techniques which have been developed over the last two decades. These are mainly high-performance liquid chromatography (HPLC) – inductively coupled plasma (ICP) – mass spectrometry (MS) based methods, along with HPLC-electrospray (ES) – tandem MS (MS/MS) which has been used with success in several cases. However, these approaches have several limitations, including limitations in monitoring relatively labile elemental species, detecting non-covalent interactions of elemental species with biomolecules and also characterising unknown elemental species.

This presentation will focus on new mass spectrometric methods and techniques used for arsenic speciation analysis. The aim of which is to be able to: (i) detect labile arsenic species, (ii) conduct targeted and non-targeted analysis of known and unknown arsenic species, respectively, (iii) and detect weak interactions of arsenic species with biomolecules i.e. proteins. For this purpose the three MS techniques that will be discussed are HPLC-ES-MS/MS, operated in the selected reaction monitoring (SRM) mode using a triple quadrupole analyser, as well as ES – Fourier-transform (FT) - ion cyclotron resonance (ICR) - MS used for ultra high resolution and accurate mass measurements. Finally, our latest advances in the development of a novel hyphenated technique involving the coupling of a nanoelectrospray ion mobility spectrometer on-line with ICP-MS will be discussed, with emphasis on its use to monitor weak interactions of arsenic species with biomolecules.