An Introduction to Speciation by HPLC/ICP-MS

Traditionally, environmental inorganic analyses have involved measuring the total quantity of an element is present. While this is still the most predominant analytical measurement, knowledge of the various forms of an element is gaining importance: for example, measuring total arsenic versus knowing the arsenic-containing components which make up the total arsenic content. The ability to determine the various forms (or species) of an element is known a speciation.

Speciation has become increasingly important for environmental monitoring because the form of the element determines its toxicity, bioavailability, and potential for migration in the environment. As an example, arsenic may be present in many forms. Inorganic arsenic exists in the trivalent and pentavalent states (AsIII, AsV), both of which are toxic. However, most organo-arsenic compounds (such as DMA, MMA, AsB, etc.) are considered non-toxic, with the notable exceptions of organo-arsenic compounds which result from the degradation of chemical warfare agents.

The easiest and most common way to perform speciation of inorganic elements is with HPLC coupled to ICP-MS: the HPLC separates the species and the ICP-MS measures them as they elute from the column. Consequently, all the chemistry is done with the HPLC; the ICP-MS is solely a detector. Therefore, knowledge of HPLC is required for successful speciation analyses.

This presentation will focus on basic considerations of speciation analysis performed by HPLC/ICP-MS.