

DEVELOPMENT OF A CAPILLARY ELECTROPHORESIS / INDUCTIVELY COUPLED PLASMA – MASS SPECTROMETER (CE/ICPMS) INTERFACE

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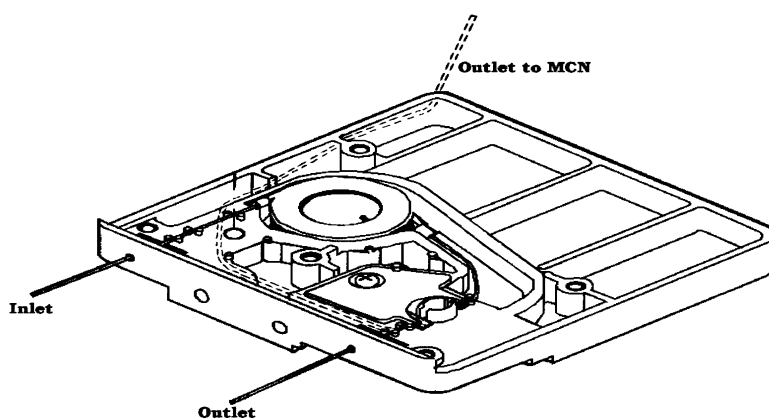
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This paper describes the construction of a CE/ICPMS interface that is to be used for the identification and quantitation of toxic and non-toxic forms of arsenic in human urine and other matrices.. CE was chosen as a means of separating organic and inorganic arsenicals because of its excellent resolution and speed, while ICPMS was used to allow on-line detection of arsenic containing species.

Capillary electrophoresis is a technique in which a high voltage is used to separate analytes of differing electrophoretic mobilities within a capillary. In this project a Beckman P/ACE 2000 capillary electrophoresis unit is used. Separations are performed in an undeactivated fused silica capillary (50 μ m ID x 400 μ m OD x 50cm length). The capillary is filled with an electrolyte (5mM p-hydroxybenzoic acid and 4mM tetradecyltrimethylammonium hydroxide) with pH adjusted to 11.3 using 1M sodium hydroxide.

To enable connection of the capillary outlet to a microconcentric glass nebuliser (MCN) while still maintaining CE function, certain modifications were required. Figure 1 shows the path of a capillary through a capillary cartridge. The inlet is the point at which electrolyte and sample are pressure injected into the capillary while the outlet is the point at which separated analytes exit into an electrolyte. Inlet (negative) and outlet (positive) electrolytes are maintained at a 15kV potential difference during separations. The broken line in figure 1 depicts the path of the capillary through a cartridge modified for connection to a MCN. In this case the capillary exits at a point where it is closest to the MCN and where it will not interfere with other CE components.

Figure 1. Capillary cartridge. Cover has been removed to show path of capillary through cartridge.



Connection to the MCN is done such that the terminal end of the capillary is immersed in an electrolyte which maintains the 15kV potential. This electrolyte is a 10 fold dilution of the electrolyte in the capillary so as not adversely effect the argon plasma characteristics. It is self aspirated from an electrolyte reservoir at a rate of 400 μ L per minute with a nebulizer gas flow rate of 1L per minute. As the electrolyte sweeps past the capillary tip, emerging analytes are carried through the nebulizer, into a glass cyclonic spray chamber and then to the argon plasma.

A Varian Ultramass ICPMS is used to monitor the column effluent. The instrument is operated in a time resolved mode enabling quantifiable peaks of elements of interest to be generated.

We will present schematics of the whole interface and results of operation trials.