Towards routine capillary electrophoresis hyphenation to ICP-MS

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Capillary electrophoresis (CE) is an ideal technique for characterizing metal-based anticancer complexes' stability and binding affinity with potential biological targets [1]. These preliminary studies contribute to optimal drug candidates being invested into clinical trials and continuing on to subsequent commercialization. Hyphenation of CE to an inductively coupled plasma–mass spectrometer (ICP-MS) means even higher specificity and sensitivity can be achieved. CE–ICP-MS hyphenation can be very challenging as there are various technical aspects that must be considered to maintain separation efficiency [2]. A means of hyphenation of CE to ICP-MS will be presented that is considerably simpler than the two currently commercially available interfaces, the CEI-100 and the Mira Mist CE interface, without sacrificing electropherogram quality or sensitivity [3].

We present key points in the development and optimization of the interface including construction methods and materials, sheath liquid composition and key ICP-MS parameters such as capillary position, sheath liquid flow rate and carrier gas flow rate. The interface is compared with alternative methods of hyphenation including the commercially available CEI-100 interface from CETAC [4]. Considerable improvement of the peak shape and the analytical features such as peak area, and migration time repeatability is shown for a cisplatin-based test system. Finally, a study of the interaction of cisplatin with various biological targets including the proteins human serum albumin, transferrin and ubiquitin, as well as the nucleotide guanosine 5'-monophosphate carried out with this CE-ICP-MS interface is presented.

Our new method of hyphenation is inexpensive, considerably easier to assemble and operate, and more robust than systems currently on the market. It has significant potential to make CE–ICP-MS a more accessible scientific technique resulting in more widespread use.

References:

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