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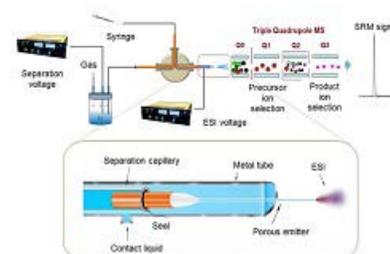
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Available Technologies

# Improved Technology for Coupling Capillary Electrophoresis with Mass Spectrometry

## SUMMARY

Capillary electrophoresis (CE) is a well-known separation technique that can be used in conjunction with mass spectrometry (MS). It provides high resolution and sensitivity, and is particularly suited for analyzing certain types of polar compounds. A major limitation to the broad applications of CE separations is its very limited sample loading capacity as compared to liquid chromatography (LC)-based separations. Various techniques have been developed to overcome this limitation, but none have been truly successful.



PNNL has developed technology that substantially increases the sample loading capability and measurement throughput of CE-MS. The technology has two major elements. The first is a microfluidic system and method for sample injection using a pneumatic microvalve rather than the more common manual or robotic switching of the capillary inlet between sample and run buffer reservoirs. The sample is pressurized and a controlled amount is dispensed onto the separation column when the valve is briefly opened. The sample injection is quantitative, and, because separation voltage is applied throughout the injection process, the sample can be introduced without interrupting an ongoing separation.

The second element is a sheathless interface for coupling CE with MS. The sheathless interface includes a larger internal-diameter separation capillary allowing large sample loading volume for performing CE separation and a smaller inner-diameter porous or coated emitter capillary for low-flow-rate electrospray ionization. A section of the emitter capillary is disposed within the separation capillary, so that it forms a sealed joint. Electric contact for electrospray ionization voltage is provided through conductive liquid enclosed in a short metal tube and the etched porous wall of the emitter capillary.

## ADVANTAGES

- \* Unbiased, lossless, high-throughput sample injection that allows for high-resolution CE separation and high-sensitivity and quantitative MS detection
- \* Flexible and reproducible sample injection volumes ranging from picoliters to microliters, based on valve opening time and injection pressure
- \* Potential to combine with nanoflow capillary LC to produce a new hybrid instrument allowing two-dimensional LC-CE separation followed by high-sensitivity MS detection.

### Patents & Intellectual Property

- » Patent #: 8277659B2
- » Patent #: 8754370B1

### Technology Portfolio(s)

- » Analytical Instrumentation
- » Mass Spectrometry Instrumentation

### Potential Industry Applications

- » Chemicals

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