Analytical Seminar

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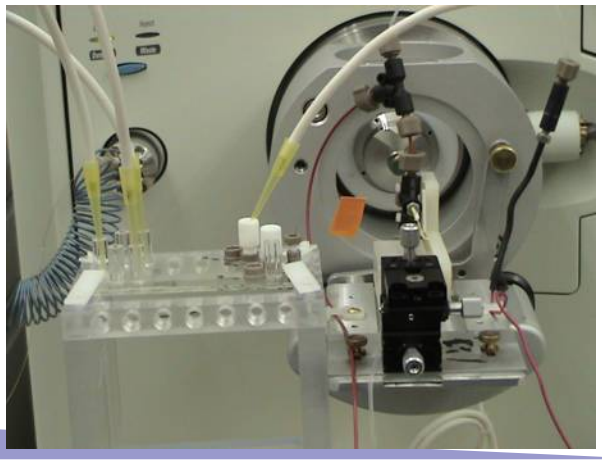
"Developing Microfluidic Devices for Proteome Analysis"

For the full potential of proteomics to be realized, new analytical tools are needed to provide improved separations and reduced limits of detection. Microfluidic systems possess many of the attributes required for the development of next-generation systems for proteome analysis. For example, microfluidic systems are capable of handling very small samples with minimal dilution while integrating separations and sample processing. This presentation will focus on the development of new separations, analyte concentrators, and improved interfaces with electrospray ionization-mass spectrometry (ESI-MS).

Increased peak capacities are needed to separate the complex samples encountered with proteomics, and improved control of analyte band elution will improve sample introduction into the MS. To achieve such characteristics we are developing a new method for traveling wave electrophoresis (TWE) that uses two interdigitated electrode arrays, one on the top and the other on the bottom of the microchannel, to define a traveling electric field wave within the microchannel. Two important characteristics of TWE are the potential to reduce dispersion by trapping the analyte within nodes of electric field waves, and the ability to switch in real-time between band velocity while modulating between separative and non-separative transport.

Rapid and efficient enrichment of charged species is achieved by interfacing a microfluidic channel with nanochannels or nanocapillaries. The mechanisms of this enrichment process are being investigated to improve compatibility within larger microfluidic systems.

Additionally, we are evaluating different approaches for interfacing microfluidic devices with ESI-MS. For protein separations, the system should be designed to maximize protein solubility and minimize non-specific adsorption. Many coatings that reduce non-specific protein adsorption also reduce EOF. Recent studies with glass membrane or gap junction interfaces reveal nanofluidic character that affects system performance.



Thursday, April 16

12:15 p.m., Rm 1315