Microfluidic Devices for Rapid, Efficient 2D Separations of Complex Peptide Mixtures

Roswitha S. Ramsey, Jeremy D. Ramsey, Stephen C. Jacobson,
and J. Michael Ramsey
Oak Ridge National Laboratory, Oak Ridge, TN 37831-6142 USA

Proteomic investigations typically rely on 2D PAGE to provide the necessary resolution required to separate the complex protein or peptide mixtures derived from cellular extracts. The difficulties associated with this slow and labor-intensive technique have prompted investigators to examine other methods including column-based 2D separations, CE coupled directly to MS, and microfluidics. We have previously shown that MEKC can be coupled with OCEC on a microchip to provide rapid 2D analysis of peptides. We have now developed a second-generation device that provides higher overall performance. Higher efficiency is obtained by lengthening the first dimension channel and incorporating low dispersion turns, increasing the second dimension sampling rate, and decreasing the injection time onto the second dimension. Peak capacities have been increased to about 5000. The analysis time for tryptic digests of various proteins remains under 10 min; a speed that easily lends itself to high throughput analysis required for proteomic related problems. The chip design, operation and results will be discussed.

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