HIGH EFFICIENCY SEPARATIONS ON MICROCHIP DEVICES

Christopher T. Culbertson, Norbert Gottschlich, Stephen C. Jacobson, and J. Michael Ramsey
Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN 37831-6142, USA

Abstract

We have fabricated a glass microchip capable of performing high efficiency 1 and 2 dimensional separations. The chip includes a 25 cm long spiral separation channel and a 1.2 cm long straight separation channel. With this design, electrophoretic separation efficiencies for dichlorofluorscein of over 1,000,000 theoretical plates have been achieved in under 46 seconds. The number of theoretical plates generated increased linearly with the applied voltage, and at the highest field strength applied the rate of theoretical plate generation was 21,000 plates/s. Micellar Electrokinetic Chromatography (MEKC) separations of 19 amino acids have been performed on this chip in under 2.5 minutes with separation efficiencies in excess of 230,000 theoretical plates. Two dimensional separations of fluorescently labeled products from tryptic digests of proteins were also performed. The first dimension used open channel electrochromatograpy and the second dimension used capillary electrophoresis. These separations took only 13 minutes and the estimated peak capacity of the system was 400.

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