JOURNAL ARTICLE

Chemical Vapor Deposition of Aminopropyl Silanes in Microfluidic Channels for Highly Efficient Microchip Capillary Electrophoresis-Electrospray Ionization-Mass Spectrometry

Published Journal Articles on Microfluidic ZipChip CE-ESI-MS
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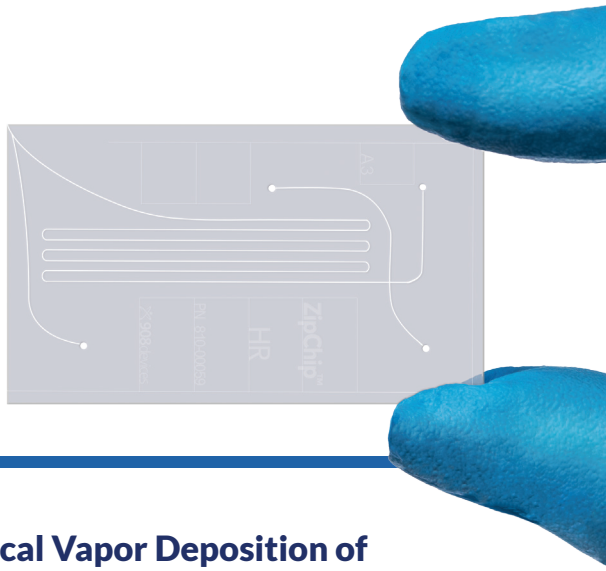
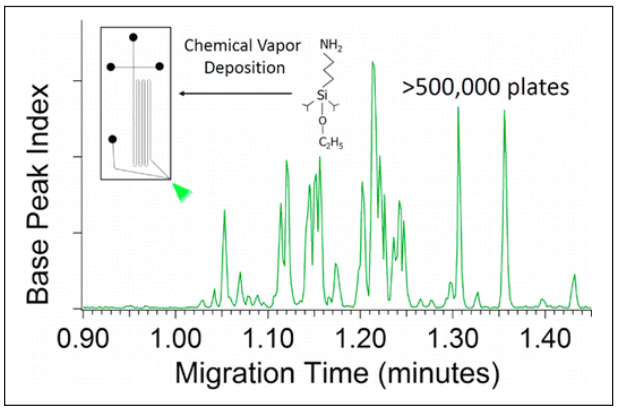


(1) Batz, N. G.; Mellors, J. S.; Alarie, J. P.; Ramsey, J. M. Chemical Vapor Deposition of Aminopropyl Silanes in Microfluidic Channels for Highly Efficient Microchip Capillary Electrophoresis-Electrospray Ionization-Mass Spectrometry. *Anal. Chem.* 2014, *86*, 3493–3500

ABSTRACT: We describe a chemical vapor deposition (CVD) method for the surface modification of glass microfluidic devices designed to perform electrophoretic separations of cationic species. The microfluidic channel surfaces were modified using aminopropyl silane reagents. Coating homogeneity was inferred by precise measurement of the separation effciency and electroosmotic mobility for multiple microfluidic devices. Devices coated with (3-aminopropyl)di-isopropylethoxysilane (APDIPES) yielded near diffusion-limited separations and exhibited little change in electroosmotic mobility between pH 2.8 and pH 7.5. We further evaluated the temporal stability of both APDIPES and (3-aminopropyl)triethoxysilane (APTES) coatings when stored for a total of 1 week under vacuum at 4 °C orfilled with pH 2.8 background electrolyte at room temperature. Measurements of electroosmotic flow (EOF) and separation effciency during this time confirmed that both coatings were stable under both conditions. Microfluidic devices with a 23 cm long, serpentine electrophoretic separation channel and integrated nanoelectrospray ionization emitter were CVD coated with APDIPES and used for capillary electrophoresis (CE)-electrospray ionization (ESI)-mass spectrometry (MS) of peptides and proteins. Peptide separations were fast and highly effcient, yielding theoretical plate counts over 600,000 and a peak capacity of 64 in less than 90 s. Intact protein separations using these devices yielded Gaussian peak profiles with separation effciencies between 100,000 and 400,000 theoretical plates.



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