

ANALYSIS OF WALL ADSORPTION OF ANALYTES IN CAPILLARY ELECTROPHORESIS

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In Capillary Electrophoresis (CE) a sample plug is injected into a micro-channel connecting two reservoirs across which an electric potential difference is applied. The channel and the reservoir are filled with an ionic solution. The induced electroosmotic flow (EOF) causes the sample to be advected towards the outlet. In addition to this bulk flow, each species of macromolecule in the sample migrates at a characteristic electrophoretic velocity causing the sample to separate into distinct bands. The passage of the bands past a detector can be recorded as a signal producing a 'chemical fingerprint' of the sample. A common problem in CE is the adsorption of some of the sample to the channel wall. This alters the wall charge and therefore the underlying EOF resulting in enhanced dispersion and consequent loss of resolution. The problem is analyzed using an asymptotic approach that exploits the narrowness of the channel diameter compared to the channel length. Nonlinear evolution equations for the cross-sectionally averaged concentration are found that reproduce well known features of CE signals.