Sample Preconcentration in Nanochannels with Tunable Surface Charge ALEXANDER EDEN, CHRISTOPHER MCCALLUM, Univ of California - Santa Barbara , BRIAN STOREY, Olin College, CARL MEINHART, SUMITA PENNATHUR, Univ of California - Santa Barbara — We present a novel method for field amplified sample stacking (FASS) and focusing in nanochannels by taking advantage of the nonuniform ion distributions produced by thick electric double layers (EDLs) in channels with heterogeneous surface charge. This is accomplished by applying a voltage bias to a gate electrode embedded within the channel wall, tuning the surface charge in a region of the channel and significantly altering the charge density and ionic strength in that region relative to the rest of the channel. The resulting nonuniform electromigration fluxes in the different regions serve to stack charged sample ions at an interface where a step change in zeta potential occurs, providing enhancement ratios superior to those exhibited in traditional microchannel FASS. Numerical simulations are performed to demonstrate the phenomenon, and resulting velocity and salt concentration profiles show good agreement with analytical results.

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