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TITLE: Using Nanofluidics to Experimentally Probe the Electric Double Layer

The electric double layer (EDL) is a fundamental component to electrokinetic micro- and nanofluidic systems. Although much experimental work has been performed in nanofluidic porous systems, using well-defined nanofluidic channels to probe the EDL provides unique insights into the coupled physics of electrokinetic systems. For example, we have experimentally validated that thick EDLs enhance resolution of electrokinetic ion separation. Moreover, dissimilar ion conductivities or surface charges in the channel create conditions where thick EDLs promote focusing of ions within the channel. Divalent ions and conditions of high surface charge have also been explored, using both current monitoring and optical fluorescent intensity measurements, as well as patterned embedded electrodes for localized application of surface charge.