ABSTRACT

Title of dissertation: ELECTROKINETIC TRANSPORT IN NANOCHANNELS GRAFTED WITH BACKBONE CHARGED POLYELECTROLYTE BRUSHES

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In this thesis, we study the electrokinetic transport in nanochannels functionalized with pH-responsive backbone charged polyelectrolyte (PE) brushes modeled using thermodynamically self-consistent augmented strong stretching theory. We investigate the electroosmotic (EOS) transport, induced by the application of external electric field, and the diffusioosmotic (DOS) transport due to applied salt concentration gradient induced electroosmotic transport in brush functionalized and brushless nanochannels with equal surface charge density. We find massive enhancement in the electrokinetic transport in PE brush functionalized nanochannels when compared to brushless nanochannels which can be ascribed to the brush induced localization of the EDL and hence the net EOS body force away from the flow retarding walls. Further, we establish that both EOS and DOS transport in nanochannels grafted with backbone charged PE brushes is larger in magnitude when compared to that in nanochannels grafted with end charged PE brushes.