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Control of electroosmotic flow in a nanofluidic channel using grafted polymer chain GARY W. SLATER, FREDERIC TESSIER, University of Ottawa — Electroosmotic flow (EOF) refers to fluid flow past a surface induced by an external electric field. It initially arises near a solid-fluid boundary due to the net charge density in the Debye layer, but the bulk of the fluid is dragged into a uniform flow by viscosity. The phenomenon is ubiquitous in DNA capillary electrophoresis, and is bound to play a critical role in emerging nanopore technologies. However, ways in which it may be controlled or quenched rest mostly on empirical evidence. The most common approach consists in coating the inner capillary surface with adsorbed or grafted polymer chains, but the definite mechanism by which this modulates the EOF remains elusive. We report on large-scale Molecular Dynamics computer simulations of EOF in a nanoscale cylindrical capillary, and discuss the impact of grafted polymers chains on the properties of EOF. We present data for the velocity of the generated flow field as a function of the polymer brush density and the size of individual grafted polymers, and compare our results with theoretical scaling laws derived in the thin Debye layer limit.

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