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Influence of Solvent Polarization on Electric Double Layer Interactions in Nanochannels[1] SUSHANTA MITRA, SIDDHARTHA DAS, University of Alberta — We discuss the influence of solvent polarization effect on the Electric Double Layer (EDL) electrostatic potential distribution and the resulting EDL interaction between similar and oppositely charged surfaces in thin nanochannels with overlapping EDLs. We invoke a Langevin-Bikerman type free energy model that explicitly accounts for the solvent polarization and the finite size (of the ions and the water dipoles) effect in delineating the EDL interactions. We witness that the solvent polarization effects leads to a weaker EDL potential gradient and a larger interaction force between the surfaces. The solvent polarization effect can successfully explain the lowering of the relative permittivity of the solvent from bulk towards the charged surface. Most importantly, the EDL interaction force with finite solvent polarization can explain the large mismatch between the corresponding experimental and existing theoretical (computed using simple Poisson-Boltzmann model) results.

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