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The Effect of Induced Electro-Osmosis on a Cylindrical Particle Next to a Surface HUI ZHAO, HAIM BAU, University of Pennsylvania — The effect of induced electro-osmosis on a cylindrical particle positioned next to an insulated wall is studied theoretically. We calculate analytically the induced hydrodynamic (electro-osmotic) and electrostatic forces using a thin double layer approximation and numerically with a multi-ion model. The forces are calculated as functions of the particle and medium dielectric constants, the electrical double layer thickness, and the distance between the particle and wall. Not surprisingly, these forces decrease as the particle's dielectric constant decreases and the distance from the wall increases. The induced resultant and hydrodynamic forces are always directed normal to the direction of the imposed electric field and away from the wall. The electrostatic force that acts on the particle (excluding the adjacent electric double layer) is directed, respectively, away and towards the wall at low and high particle dielectric constants. At low and high electric field intensities, respectively, all the forces increase linearly and sublinearly with the square of the electric field intensity. Among other things, the work has important implications for PIV-based, near wall measurements in electro-osmotic flows.

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