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Effect of pore's geometry on the electroosmotic flow and nanoparticle dynamics in the nanopore[1] ZACHERY HULINGS, DMITRIY MELNIKOV, MARIA GRACHEVA, Clarkson University — We theoretically study how the electroosmotic fluid velocity in a charged cylindrical nanopore in a solid state membranes depends on the pore's geometry, electrolyte concentration, and applied electrolyte bias. We find that in long pores, the fluid velocity follows the classical von Smoluchowski result for an infinite pore with a maximum along the pore axis. However, when the pore's length is comparable to its diameter, the velocity profile develops a local minimum along the pore axis with a maximum value near the membrane walls. The minimum becomes more pronounced when the electrolyte concentration and/or applied bias become larger. We attribute this effect to the inhomogeneous electric field distribution in the nanopore with the field along the axis of the pore being smaller than along the pore's walls due to the effects of access resistance on each side of the channel. We also investigate repercussions of such a velocity profile on the transport of a nanoparticle through the nanopore.

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