Abstract Submitted
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Electrokinetic effects near a membrane DAVID LACOSTE, CNRS-Paris — We discuss the electrostatic and electrokinetic contribution to the elastic moduli of a cell or artificial membrane placed in an electrolyte and driven by a DC electric field. The field drives ion currents across the membrane, through specific channels, pumps or natural pores. In steady state, charges accumulate in the Debye layers close to the membrane, modifying the membrane elastic moduli. We first study a model of a membrane of zero thickness, later generalizing this treatment to allow for a finite thickness and finite dielectric constant. Our results clarify and extend the results presented in [D. Lacoste, M. Cosentino Lagomarsino, and J. F. Joanny, Europhys. Lett., **77**, 18006 (2007)], by providing a physical explanation for a destabilizing term proportional to kps^3 in the fluctuation spectrum, which we relate to a nonlinear (E^2) electro-kinetic effect called induced-charge electro-osmosis (ICEO). Recent studies of ICEO have focused on electrodes and polarizable particles, where an applied bulk field is perturbed by capacitive charging of the double layer and drives flow along the field axis toward surface protrusions; we predict similar ICEO flows around driven membranes, due to curvature-induced tangential fields within a non-equilibrium double layer, which hydrodynamically enhance protrusions.

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