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Deformations of a pre-stretched elastic membrane driven by non-uniform electroosmotic flow[1] MORAN BERCOVICI, EVGENIY BOYKO, AMIR GAT, Technion - Israel Institute of Technology — We study viscous-elastic dynamics of fluid confined between a rigid plate and a pre-stretched elastic membrane subjected to non-uniform electroosmotic flow, and focus on the case of a finite-size membrane clamped at its boundaries. Considering small deformations of a strongly pre-stretched membrane, and applying the lubrication approximation for the flow, we derive a linearized leading-order non-homogenous 4th order diffusion equation governing the deformation and pressure fields. We derive a time-dependent Green's function for a rectangular domain, and use it to obtain several basic solutions for the cases of constant and time varying electric fields. In addition, defining an asymptotic expansion where the small parameter is the ratio of the induced to prescribed tension, we obtain a set of four one-way coupled equations providing a first order correction for the deformation field.

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