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Polymer capture by electro-osmotic flow of oppositely charged nanopores CHIU TAI ANDREW WONG, M. MUTHUKUMAR, Department of Polymer Science and Engineering, University of Massachusetts Amherst — We have addressed theoretically the hydrodynamic effect on the translocation of DNA through nanopores. We consider the cases of nanopore surface charge being opposite to the charge of the translocating polymer. We show that, because of the high electric field across the nanopore in DNA translocation experiments, electro-osmotic flow is able to create an absorbing region comparable to the size of the polymer around the nanopore. Within this capturing region, the velocity gradient of the fluid flow is high enough for the polymer to undergo coil-stretch transition. The stretched conformation reduces the entropic barrier of translocation. The diffusion limited translocation rate is found to be proportional to the applied voltage. In our theory, many experimental variables (electric field, surface potential, pore radius, dielectric constant, temperature, and salt concentration) appear through a single universal parameter. We have made quantitative predictions on the size of the adsorption region near the pore for the polymer and on the rate of translocation.

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