

Abstract Submitted  
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**Modeling the electrophoretic separation of short biological molecules in nanofluidic devices**<sup>1</sup> GHASSAN FAYAD<sup>2</sup>, NICOLAS HADJICONSTANTINOU, Mechanical Engineering Department, MIT — Via comparisons with Brownian Dynamics simulations of the worm-like-chain and rigid-rod models, and the experimental results of Fu et al. [*Phys. Rev. Lett.*, **97**, 018103 (2006)], we demonstrate that, for the purposes of low-to-medium field electrophoretic separation in periodic nanofilter arrays, sufficiently short biomolecules can be modeled as point particles, with their orientational degrees of freedom accounted for using partition coefficients. This observation is used in the present work to build a particularly simple and efficient Brownian Dynamics simulation method. Particular attention is paid to the model's ability to quantitatively capture experimental results using realistic values of all physical parameters. A variance-reduction method is developed for efficiently simulating arbitrarily small forcing electric fields.

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