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DNA-Particle Hydrodynamic Interactions In Microchannels

YENG-LONG CHEN, Academia Sinica — The hydrodynamic contribution to the dynamics of DNA - particle mixtures in microfluidic channels is important for phenomena such as DNA/particle aggregation and DNA conformation change. Recent simulation and experimental works have successfully showed the importance of hydrodynamic contributions to the dynamics of DNA migration away from microchannel walls in a pressure-driven flow. In this work, we investigate the interplay between particle and DNA hydrodynamics by employing the lattice Boltzmann method (LBM) and coarse-grained Brownian dynamics. In addition, particle-DNA hard core interactions also affect the conformation and the dynamics of the flexible DNA molecule. The roles of particle / DNA size asymmetry and DNA and particle concentrations on the dynamic properties of the solution are systematically investigated.

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