Abstract Submitted
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Order Preservation Between Brownian Particles Modeled By Langevin Dynamics[1] WILLIAM MAULBETSCH, WILLIAM POOLE, JOSEPH BUSH, DEREK STEIN, Brown University — We studied the dynamics of two overdamped Brownian particles in an elongational force gradient following their release from some initial separation. Using a modified one-dimensional Langevin equation, we computed the probability that the particles maintain their order as a function of time. The probability approaches unity when the work required to bring the particles together against the force gradient greatly exceeds the thermal energy, k_BT. The time window within which the particles are most likely to reverse their order is given by the time to diffuse the initial separation. We apply our theoretical model to the dynamics of DNA monomers approaching the vertex of the Taylor cone in an electrospray ionization mass spectrometer. The likelihood of preserving the sequential order is estimated to be 95% when the neighboring monomers of a stretched polymer are cleaved within 10 nm of the vertex. The implications of these results to a DNA sequencing strategy will be discussed.

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