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Universal Crossover Dynamics of a Semi-Flexible Polymer in Two Dimensions[1] ANIKET BHATTACHARYA, AIQUN HUANG, RAMESH ADHIKARI, University of Central Florida, KURT BINDER, Johannes Gutenberg-Universität Mainz — We present a unified scaling theory for the dynamics of monomers for dilute solutions of semiflexible polymers under good solvent conditions in the free draining limit. Our theory encompasses the well-known regime of mean square displacements (MSDs) of stiff chains growing like $t^{3/4}$ with time (R. Granek, J. Phys. II (Paris) **7**, 1767 (1997); E. Farge and A. C. Maggs, Macromolecules **26**, 5041 (1993)) due to bending motions, and the Rouse regime $t^{2\nu/(1+2\nu)}$ where ν is the Flory exponent describing the radius R of a swollen flexible coil. We identify how the prefactors of these laws scale with the persistence length ℓ_p, and show that a crossover from stiff to flexible behavior occurs at a MSD of order ℓ_p^2 (at a time proportional to ℓ_p^3), a second crossover (to diffusive motion) occurs when the MSD is of order R^2. We also provide compelling evidence for the theory by carrying out large scale Molecular Dynamics simulations in $d = 2$ dimensions.

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