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Numerical Simulation of a Brownian Elastic Filament in Random Stokes Flow¹ STEVEN ELLIOTT, KARIM FIGUEROA, YUAN-NAN YOUNG, New Jersey Institute of Technology — The dynamics of elastic filaments in Stokes flow has significant effects on its ability to be transported (Young and Shelley, PRL, 99, 058303, 2007). Motivated by these results, in this work we numerically investigate the dynamics of an elastic filament in a random Stokes flow. By employing the numerical algorithm designed by Tonberg and Shelley (JCP, 196, 8, 2004), our area of focus is primarily concerned with dynamics of the filament in a random cellular flow. We compute the critical value of β (the ratio of the strength of the flow compared to the rigidity of the filament) where the dynamics of the filament change in terms of its susceptibility to buckling instability. We also calculate the effective diffusivity of the filament in various random Stokes flows. Furthermore, thermal fluctuations are incorporated into the slender-body equations of motion, and their effects on filament transport in Stokes flows are quantified. Finally, preliminary work on the hydrodynamic interaction effects on filament transport will be presented.

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