

# McKean–Vlasov diffusion and the well-posedness of the Hookean bead-spring chain model for dilute polymeric fluids

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We report PDE-analytic results, aimed at dispelling certain misconceptions in the polymer physics literature associated with Hookean bead-spring chain models. We show in particular that when the flow domain is bounded the configuration space for the Hookean bead-spring chain model is also bounded (rather than unbounded, as is commonly stated in the literature), and that the Fokker–Planck equation featuring in the model is uniformly parabolic, containing a centre-of-mass diffusion term (rather than mixed hyperbolic-parabolic with no center-of-mass diffusion term). We also provide a rigorous proof of a formal asymptotic argument by Schieber and Öttinger (J. Schieber and H. C. Öttinger, The effects of bead inertia on the Rouse model, *J. Chem. Phys.* 89 (1988), no. 11), asserting that in the small-mass limit the model results in equilibration in momentum space. Our proofs rely on entropy/entropy dissipation estimates combined with various weak compactness and compensated compactness techniques. The talk is based on joint work with Ghazlane Yahiaoui (Oxford).