Abstract Submitted
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A geometric constraint minimization algorithm for concentrated active suspension[1] BRYCE PALMER, Michigan State University, WEN YAN, Flatiron Institute, TONG GAO, Michigan State University — We present a direct particle-simulation algorithm for concentrated active suspensions composed of slender, self-propelling Brownian rods. The rod motion and rod-rod hydrodynamic interactions are described using a slender-body model proposed by Saintillan and Shelley ["Emergence of coherent structures and large-scale flows in motile suspensions," J. R. Soc. Interface, 9:571, 2012]. Moreover, we implement a geometric constraint minimization technique to avoid particle penetration when rods are subjected to frequent collisions. We perform simulations in the periodic cubic domain across volume fractions, with the maximum volume fraction up to about 40%. In semi-dilute cases, we demonstrate the algorithm can successfully capture critical behaviors such as the transition to large-scale collective dynamics as predicted by mean-field theories. Moreover, in the concentrated regime, we can track density fluctuations, coherent flows, as well as the evolution of topological structures due to the nematic alignment of motile rods.

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