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von

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über

“The dynamics of self-propelled particles and the buckling transition of a semiflexible polymer”

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Inhalt:
Various challenges are faced when microorganisms or artificially synthesized self-propelled particles move autonomously in aqueous media at low Reynolds number. These active agents are intrinsically out of equilibrium and exhibit peculiar dynamical behavior due to the complex interplay of stochastic fluctuations and directed swimming motion. In particular, these particles display fascinating physics ranging from the run-and-tumble motion of bacteria to the noisy circular trajectories of biological or artifical microswimmers due to hydrodynamic couplings in the vicinity of interfaces or chiral body shapes. Here, we provide a theoretical analysis of the spatiotemporal dynamics of different types of active particles in terms of the experimentally accessible intermediate scattering function. Our analytical predictions characterize the spatiotemporal dynamics of catalytic Janus particles, a paradigmatic class of synthetic active agents, from the smallest length scales where translational Brownian motion dominates, up to the largest ones, which probe the randomization of the swimming direction due to rotational diffusion. We also show that our theoretical framework finds application in different areas such as polymer physics.

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