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Flexibility governs diffusivity of active colloidal chains[1] BIPUL BISWAS, GURUSWAMY KUMARASWAMY, CSIR-NCL, RAJ MANNA, IITM, ABHRAJIT LASKAR, IMSc, SUNIL KUMAR, IITM, RONOJOY ADHIKARI, IMSc — We use ice templating to form polymeric chains of colloidal particles. Here, the colloidal particles are bonded together through a flexible crosslinked polymer mesh. Adjusting the crosslink density in this mesh allows us to tune the flexibility of the colloidal chains. The advantage of this model is that the spatial coordinate of each monomer along these chains can be tracked using optical microscopy. We present data on colloidal chains that have been rendered active by coating the colloidal chains with platinum nanoparticles that catalyze the decomposition of hydrogen peroxide. We measure the center of mass diffusion of colloidal chains as a function of chain length and contrast active and Brownian chains. The diffusivity of Brownian chains decreases as chain length increases, and is not strongly dependent on the chain flexibility. In contrast, the diffusivity of active chains increases with increase in chain flexibility. Our experiments accord well with models that ascribe the activity as arising from hydrodynamic interactions from stresslets distributed along the chain length.

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