

Abstract Submitted
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Interactions and Collective Behaviour of Chemotactic Active Colloids SUROPRIYA SAHA, Indian Institute of Science, SURBHI HABLANI, TIFR Centre for Interdisciplinary Sciences, 21 Brundavan Colony, Narsingi, Hyderabad 500075, RAMIN GOLESTANIAN, Rudolf Peierls Center for Theoretical Physics, University of Oxford, 1 Keble Road, Oxford OX1 3NP, United Kingdom, SRIRAM RAMASWAMY, TIFR Centre for Interdisciplinary Sciences, 21 Brundavan Colony, Narsingi, Hyderabad 500075 — Artificial realizations of motility point in the direction of a new paradigm in engineering, through the design of emergent behavior by manipulating properties at the scale of the individual components. Catalytic colloidal swimmers are a particularly promising example of such systems. Here we present a comprehensive theoretical description of gradient-sensing of an individual swimmer, leading controllably to chemotactic or anti-chemotactic behavior. We use it to study the scattering of such a swimmer off a reactant source and construct a framework for studying their two body interactions and finally their collective behavior. We find that both the positional and the orientational degrees of freedom of the active colloids can exhibit condensation, signalling formation of clusters and asters. We present prescriptions for how to tune the surface properties of the colloids during fabrication to achieve each type of behavior. We further study the athermal fluctuations of a pointed tracer particle in a bath of such swimmers.

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