Prof. K. K. Mohammed Yusuff Endowment Lecture

"Statistical Mechanics of Active Polymers: from dilute to dense phase"

8th May, 2024

@

11:00 AM

by

Prof. Rajarshi Chakrabarti

Dept. of Chemistry

IIT Mumbai

Venue: Seminar Hall, DAC, CUSAT

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

Statistical Mechanics of active polymers: from dilute to dense phase

Rajarshi Chakrabarti
Department of Chemistry, Indian Institute of Technology Bombay, Mumbai 400076, India

Colloidal chains driven by local chemical reactions [1] or in a bath of bacteria [2] show unusual scaling behavior, not observed in equilibrium. In the first part of the talk, I will briefly discuss some analytically solvable models for a single active polymer chain or a passive polymer chain in active baths [3-5]. These models can actually predict experimentally observed superdiffusive motion of the tagged monomer of a colloidal chain in an active bacteria bath. These models also predict swelling of active chains in passive baths and passive chains in active baths, long-time enhanced diffusion as seen in experiments [1-2].

To understand the motion of active shape- deforming agents, a collection of rings made of active Brownian particles (ABPs) [3, 4] for different packing fractions and activities is investigated using computer simulations. This will be the topic for the second part of my talk. Our computer simulations reveal that active rings display a novel dynamic clustering [5] instead of the conventional motility- induced phase separation (MIPS) [6] as observed in case of collection of ABPs. Surprisingly, increasing packing fraction of rings exhibits a non-monotonicity in the dynamics due to the formation of a large number of small clusters. The conformational fluctuations of the polymers suppress MIPS exhibited by ABPs. This demonstrates a complex interplay between activity, topology, and connectivity.

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