Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Internal Webinar

Non-equilibrium phase transition in a two dimensional colloidal suspension

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We study the phase behaviour of a two dimensional colloidal system of repulsively interacting particles driven by one dimensional stochastic asymmetric linear ratchet that induces a time averaged directed particle current through the system. We showed a non-equilibrium melting transition as the directed current approaches a maximum associated with a resonance of the ratcheting frequency and also examine how particle current behaves with the asymmetric parameter of the potential. We use extensive molecular dynamics simulations to present a detailed phase diagram by dealing with three parameters which are density of the system (ρ), ratcheting rate (f) and asymmetric parameter of the potential. With the help of numerically calculated structure factors, solid and hexatic order parameters, and pair and positional correlation functions, we show that the non-equilibrium melting is a continuous transition from a quasi-longranged ordered solid to a hexatic phase. The transition is influenced by the unbinding of dislocations, and formation of defect clusters.

Tuesday, Apr 22nd 2025

14:00 Hrs