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Hydrodynamic effects on phase transition in active matter. HARINADHA GIDITURI, V S AKELLA, MAHESH PANCHAGNULA, SRIKANTH VEDANTAM, Indian Inst of Tech-Madras, MULTIPHASE FLOW PHYSICS LAB TEAM — Organized motion of active (self-propelled) objects are ubiquitous in nature. The objective of this study to investigate the effect of hydrodynamics on the coherent structures in active and passive particle mixtures. We use a mesoscopic method Dissipative Particle Dynamics (DPD). The system shows three different states viz. meso-turbulent (disordered state), polar flock and vortical (ordered state) for different values of activity and volume fraction of active particles. From our numerical simulations we construct a phase diagram between activity co-efficient, volume fraction and viscosity of the passive fluid. Transition from vortical to polar is triggered by increasing the viscosity of passive fluid which causes strong short-range hydrodynamic interactions. However, as the viscosity of the fluid decreases, both vortical and meso-turbulent states transition to polar flock phase. We also calculated the diffusion co-efficients via mean square displacement (MSD) for passive and active particles. We observe ballistic and diffusive regimes in the present system.

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