LadHyX Seminar – September 28, 15:00, – LadHyX Library

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**Emerging states of isotropic autophoretic disks: from crystalline solid to active turbulence**

Active droplets swim autonomously in viscous fluids due to the nonlinear interplay between solute transport with self-generated Marangoni flows. This mechanism is also responsible for the spontaneous propulsion of disk-shaped camphor boats on a liquid-air interface. Here, we study the collective motion of isotropic autophoretic disks representing a paradigmatic system for suspensions of active droplets and camphor boats. We conducted extensive two-dimensional particle-resolved simulations considering full hydro-chemical interactions, spanning a two-parameter space of Péclet number and area fraction. Varying the two parameters, the disk suspensions exhibit multiple emerging states: triangular lattice crystal, liquid phase, gas of clusters, and active turbulence. A narrow range of hexatic phase between the liquid and solid phases has been identified, the emergence of which is captured by our far-field scaling theory. Our simulations have reproduced a few experimental observations, including the crossing and reflecting trajectories of two active droplets, and the stationary crystalline structure formed by or turbulent motion of camphor boats.