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**Emergent structures and dynamics in suspensions of self-phoretic colloids** ANDREA SCAGLIARINI, Department of Physics, University of Rome "Tor Vergata", IGNACIO PAGONABARRAGA, Department of Fundamental Physics, University of Barcelona — Active fluids, such as suspensions of self-propelled particles , are a fascinating example of Soft Matter displaying complex collective behaviours which provide challenges in non-equilibrium Statistical Physics. The recent development of techniques to assemble miniaturized devices has led to a growing interest for micro and nanoscale engines that can perform autonomous motion ("microrobots"), as, for instance, self-phoretic colloids, for which the propulsion is induced by the generation of a chemical species in a reaction catalyzed at the particle surface. We perform a mesoscopic numerical study of suspensions of self-phoretic colloids. We show that, at changing the sign of the phoretic mobility (which accounts for the colloid-solute interactions), the system switches from a cluster phase to a state with slowed dynamics. We find that the cluster size distribution follows an exponential behaviour, with a characteristic size growing linearly with the colloid activity, while the density fluctuations grow as a power-law with an exponent depending on the cluster fractal dimension.We single out hydrodynamic interactions, showing that their effect is to work against cluster formation. For positive $\mu$, we observe that colloids tend to reach an ordered state on a triangular lattice.

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