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Active self-assembly and collective chemotaxis of catalytic colloids

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The non-equilibrium dynamics of phoretically active colloids could lead to spontaneous formation of interesting structures and patterns due to the presence of long-range Coulomb-like interactions. We examine theoretically the consequences of this interaction, and present some results that exemplify the type of emergent properties that could result from them. In particular, we discuss the following: (1) spontaneous formation of small stable clusters or "molecules" that can exhibit functionality that depends on geometry (2) collective chemotaxis in a solution of catalytically active colloids that could lead to cluster formation, aster condensation, and spontaneous oscillations, and (3) swarming - in the form of a comet - of light-induced thermally active colloids with negative Soret coefficient due to a shadowing interaction.