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When push comes to shove: Contact-triggered active particles[1]
MAYANK AGRAWAL, ISAAC BRUSS, Department of Chemical Engineering, SHARON GLOTZER, Department of Chemical Engineering, Department of Material Science and Engineering — Active matter is inherently out-of-equilibrium, and therefore exhibits phenomenon not observed at thermodynamic equilibrium. In general, active particles convert energy from the environment into directed motion. For some biological and synthetic systems, this energy conversion is triggered by a particle-particle contact event. For example: neural crest cells chase placodal cells by chemotaxis; chemically different droplets in contact can generate asymmetrical flows due to a surface tension gradient that induces propulsion; and electrohydrodynamic flow fields around dissimilar colloids can generate propulsive forces on dimers. To understand such systems we extend the standard models used to study active matter so that activity is now triggered on contact. We numerically implement and study this model on a binary mixture of particles. We show that this system phase separates into dense and dilute regions similar to self-propelled particles. However, there exists 4-fold and 6-fold ordering within the clusters. We further resolve the dense phase into inter-penetrating lattice structures of the two particle types. The understanding of these phenomena can be employed to synthesize novel materials with reconfigurable lattice structures.

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