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Transmitting chemical and mechanical signals via a cluster of microcapsules AMITABH BHATTACHARYA, GERMAN V. KOLMAKOV, ANNA C. BALAZS, Dept of Chem Engg, University of Pittsburgh — Biological cells often perform tasks collectively by sensing the local density of cells and then performing a particular task in concert (e.g. emitting light) when this cell density increases above a certain threshold. Using an approach based on the Lattice-Boltzmann method, we simulate a similar synthetic system consisting of primarily two kinds of signaling microcapsules, immersed in a fluid, and sitting on an adhesive surface. The first kind constantly releases "agonist" molecules, and the second kind release nanoparticles above a certain threshold concentration of "agonist" molecules. The nanoparticles adsorb onto the surface and decrease the capsule-surface adhesion strength at the point of adsorption. The resulting gradients in adhesion strength along the surface induces motion in the microcapsules. We examine arrangements of these microcapsules in which mechanical and chemical signals can cascade through a cluster of microcapsules, and comment on the robustness of this system.

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