Emergent Collective Behavior of Autonomous Nano/microparticles

Ayusman Sen
Department of Chemistry, The Pennsylvania State University, University Park, Pennsylvania 16802, USA

One of the more interesting recent discoveries has been the ability to design nano/microparticles which catalytically harness the chemical energy in their environment to move autonomously. These "bots" can be directed by chemical and light gradients. Further, our group has developed systems in which chemical secretions from the translating micro/nanomotors initiate long-range, collective interactions among the particles via self-diffusiophoresis. This behavior is reminiscent of quorum sensing organisms that swarm in response to a minimum threshold concentration of a signaling chemical. We have demonstrated potential applications of these system in logic gates, microscale pumping, and hierarchical assembly. We will discuss recent experimental results, as well as approaches to the modeling of the complex emergent behavior of these particles.

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