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Interactions of colloidal particles in an active medium EDWARD J. BANIGAN, Department of Physics & Astronomy, Northwestern University, JOHN F. MARKO, Departments of Physics & Astronomy and Molecular Biosciences, Northwestern University — An individual colloidal particle that asymmetrically catalyzes chemical reactions generates a chemical concentration gradient, and thus moves directionally along the gradient by self-diffusiophoresis. Symmetrical particles may also move via their interactions with the chemical gradients generated by other active colloidal particles. We develop and analytically solve a model for self-diffusiophoresis in a medium that both produces and destroys a chemical that interacts with the colloidal particle. This alters the scaling of the self-diffusiophoretic velocity from the case of the inert medium and screens the interaction between colloidal particles. We numerically simulate multiple catalytic particles in the active medium and extract the basic rules for their interactions. Finally, we propose that this mechanism could be used for biological processes involving dynamic self-organization, such as chromosomal locus positioning.

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