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Microscopic walkers in concentrated colloidal monolayers: Oscillators, rollers and spinners JUAN LUIS ARAGONES, JOSHUA STEIMEL, ALFREDO ALEXANDER-KATZ, MIT — We have studied the dynamical behavior of paramagnetic particles under a rotational magnetic field in concentrated passive colloidal monolayers, and their effects on the dynamics and structure of the monolayer. Depending on the direction of the applied rotating magnetic field, paramagnetic particles will rotate parallel or perpendicular to the substrate plane, generating two types of active particles: *rollers*, whose angular momentum is converted to translational motion through the force of friction between the particles and substrate, and *spinners*, which rotate parallel to the substrate. Additionally, *oscillators* can be created from *rollers* by applying oscillating magnetic fields. We have carried out experiments and simulations to analyze the dynamics of these active particles in dense colloidal monolayers. The non-equilibrium nature of these systems confers quite interesting behavior; we observed activity-induced phase separation and local vortex formation around *rollers* and *spinners* due to the fluid media. These vortices interact between them creating patterns and cooperative movements.

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