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Dynamic Self-Assembly and Self-Propulsion in Nonequilibrium Magnetic Colloidal Ensembles at a Liquid/Liquid Interface[1] ALEXEY SNEZHKO, IGOR ARANSON, Argonne National Lab — Ensembles of interacting particles subject to external periodic energy fluxes often develop nontrivial dynamics. Magnetic colloidal particles suspended over an interface of two immiscible liquids and energized by vertical alternating magnetic fields give rise to novel dynamic self-assembled structures ("asters") which are not accessible at the liquid/air interfaces. Ferromagnetically ordered nickel spherical particles have been used in our experiments. Novel structures are attributed to the interplay between surface waves, generated at the liquid/liquid interface by the collective response of magnetic microparticles to the alternating magnetic field, and hydrodynamic fields induced in the boundary layers of *both* liquids forming the interface. Two types of magnetic order is reported. We show that self-assembled aster structures become distorted in the presence of a small in-plane dc magnetic field and develop self-propulsion. The speed of locomotion can be effectively tuned by the amplitude of the dc field.

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