Abstract Submitted
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Self-assembled controllable microswimmers GALIEN GROSJEAN, University of Liege, GUILLAUME LAGUBEAU, University of Santiago, Chile, ALEXIS DARRAS, GEOFFROY LUMAY, MAXIME HUBERT, NICOLAS VANDEWALLE, University of Liege — Because they cause a deformation of the interface, floating particles interact. In particular, identical particles attract each other. To counter this attraction, particles possessing a large magnetic moment $\vec{m}$ are used. When $\vec{m}$ is perpendicular to the surface, dipole-dipole interaction is repulsive. This competition of forces can lead to the spontaneous formation of organized structures. By using submillimetric steel spheres for which $\vec{m} \propto \vec{B}$, interdistances in the system can be precisely tuned. Here, we deform these self-assemblies by adding a horizontal contribution $\vec{m}_x$ to the magnetic moment. Time reversal symmetry is broken in the system, leading to locomotion at low Reynolds number. Moreover, swimming direction depends on the orientation of field, meaning that swimming trajectories can be finely controlled. A model allows to understand the breaking of symmetry, while a study of the vibration modes gives further informations on the dynamics of this sytem. Because this system forms by self-assembly, it allows miniaturization with applications such as cargo transport or solvent flows. It is highly versatile, being composed of simple passive particles and controlled by magnetic fields.

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