Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Novel colloidal probes to quantify hydrodynamic and phoretic interactions CELSO CARRASCO, ANTOINE AUBRET, QUENTIN MARTINET, JEREMIE PALACCI, University of California, San Diego, MATERIALI MOLLI LAB TEAM — Janus microswimmers are considered model systems in the study of active matter. They are composite particles constituted of a chemically inert and catalytic component. They consume the surrounding fuel, converting available free energy into work by harnessing the interfacial phenomenon of diffusiophoresis, the migration in a gradient of chemicals. As they move the fluid, microswimmers interact hydrodynamically and via phoresis. Quantifying and understanding non-equilibrium interactions is of primary importance for the design of artificial micromachines made of active components and emergent properties in collections of active particles. Generic colloidal tracers are ill-defined for this task as they are sensitive to gradients (phoresis) and advected by flows (hydrodynamics). We develop and synthesize novel colloidal tracers with tunable phoretic mobility to quantify and disentangle phoretic and hydrodynamic interactions. We demonstrate that the particles allow us to better understand the behavior of individual microswimmers and the contributing interactions of more complex machines, e.g. self-spinning microgears. Our approach will constitute an adequate benchmark to guide the design of complex interactions in assemblies of active microparticles.

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Date submitted: 10 Aug 2020 Electronic form version 1.4