Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Rheology of a dilute suspension of active particles with orientation-dependent activity WILLIAM USPAL, RUBEN POEHNL, University of Hawai'i at Manoa, Department of Mechanical Engineering — Suspensions of self-motile particles can exhibit rich rheological properties, including superfluidity, owing to the injection of energy into the system at the scale of a single particle. Chemically active colloids self-propel by catalyzing the decomposition of molecular "fuel" available in the surrounding solution. In the presence of chemical gradients, or if the catalysis depends on incident light, the chemical activity of the particle will depend on orientation with respect to an external field. This orientation dependence opens new possibilities for designing active fluids with field-tunable rheology. Here, we develop a theoretical framework for computing the rheological properties of a dilute suspension of such particles. In particular, we present theoretical expressions for the stresslet of a chemically active particle, and compute the ensemble-averaged stresslet for various scenarios with field-dependent activity.

William Uspal
University of Hawai'i at Manoa

Date submitted: 10 Aug 2020 Electronic form version 1.4