Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Collective dynamics and mixing in a suspension of micro-rotors ENKELEIDA LUSHI, Brown University, KYONGMIN YEO, IBM Research, PETIA VLAHOVSKA, Brown University — We investigate theoretically and computationally the dynamics of many interacting micro-rotors suspended in fluid. As a particle rotates due to intrinsic or external torques, it disturbs the surrounding fluid and the motion of neighbouring particles. It can be shown that the motion of less than four point rotors is periodic and above that number their trajectories can become chaotic, a dynamics reminiscent to that of 2D point-vortices. If the full hydrodynamical interactions and lubrication effects between the particles are accounted for in a finite domain, a richer dynamics emerges. We exploit this coupled dynamics between micro-rotors and the structure of the generated fluid flows to mix a passive dye field or passive sphere particles also immersed in the fluid. The efficiency of the mixing for a variety of parameters will be discussed as well as experimental realizations.

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Date submitted: 01 Aug 2014 Electronic form version 1.4