Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Phase behavior of monolayer suspensions of counter rotating rotors KYONGMIN YEO, IBM Research, ENKELEIDA LUSHI, PETIA VLAHOVSKA, Brown University — The dynamics of monolayer suspensions of counter-rotating spherical rotors is investigated by using the force coupling method. The motions of the suspended rotors are confined to the horizontal plane perpendicular to the axis of rotation. The suspensions are equally divided by two species of spherical particles, which are rotating under equal-magnitude opposite-sign torques. Unlike the previous results in non-hydrodynamic limit, it is shown that the conversion rate of the rotational kinetic energy to the translational kinetic energy increases slowly with the increase in volume fraction (ϕ) and eventually exhibits a sharp drop around a critical volume fraction ($\phi \simeq 0.54$). A closer investigation of suspension microstructure reveals that the rotors of the same torque start to form a cluster for $\phi \geq 0.30$. Around the critical volume fraction, hexagonal structures emerge in the suspensions and the particle mobility is significantly hindered by the caging effects.

Enkeleida Lushi
Brown University

Date submitted: 31 Jul 2014 Electronic form version 1.4