Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

**Numerical study of a semi-dilute, non-colloidal suspension in a Taylor-Couette flow**[1] CHANGWOO KANG, PARISA MIRBOD, University of Illinois at Chicago — We conduct direct numerical simulations for the Taylor-Couette flow of semi-dilute, neutrally buoyant, and non-colloidal suspensions using suspension balance model (SBM) and rheological constitutive laws. In this study, we considered the Taylor-Couett with rotating inner cylinder and stationary outer one. In additon, the radius ratio of the Couette apparatus is constant $\eta$ =0.877, the bulk particle volume fraction is fixed $\phi_b$ =0.1, but the particle size ratios varies, i.e., $\epsilon(= d/a)$ =60, 200, where $d$ is the gap with and $a$ is the radius of particles. The flow instability and transitions affected by the suspended particles are examined by varying the Reynolds number of suspensions based on the rotating angular velocity and the effective viscosity of suspensions. The critical Reynolds number in which counter-rotating vortices arise in the annulus is predicted, and the nature of the instability is investigated. Flow and particle concentration fields are shown in detail to characterize the flow structure and particle distribution. The sequence of transitions is determined by the flow pattern. Furthermore, friction and torque coefficient of the suspension flow are computed and compared with the values obtained for pure fluid flows.

[1]This work has been supported in part by the National Science Foundation award 1854376 and partially by the Army Research Office award W911NF-18-1-0356.

Parisa Mirbod
University of Illinois at Chicago

Date submitted: 03 Aug 2020 Electronic form version 1.4