Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Fluids for flow batteries: the case of MEEPT[1] YILIN WANG, University of Illinois at Urbana-Champaign, AMAN PREET KAUR, N. HARSHA ATTANAYAKE, University of Kentucky, ZHOU YU, Argonne National Laboratory, THILINI M. SUDUWELLA, University of Kentucky, LEI CHENG, Argonne National Laboratory, SUSAN A. ODOM, University of Kentucky, RANDY H. EWOLDT, University of Illinois at Urbana-Champaign, JCESR COLLABORATION — We report viscous flow properties of a redox-active organic molecule, MEEPT, a candidate for non-aqueous redox flow batteries, and its radical cations. A microfluidic viscometer enabled the use of small sample volumes in determining viscosity as a function of shear rate and concentration in acetonitrile, both with and without supporting salts. From concentration-dependent viscosity measurements, molecular information, such as intrinsic viscosity, hydrodynamic diameter, and the Huggins coefficient were inferred. Model fit credibility was assessed using the Bayesian Information Criterion. We found that the MEEPT and its charged cation are "flowable" and do not flocculate at concentrations up to 0.5 M. MEEPT has a hydrodynamic diameter of ~ 8.5 Å, which is comparable to molecular dimensions of single molecules obtained from density function theory calculations. The results suggest that MEEPT is a promising candidate for redox flow batteries in terms of its viscous flow properties. Reference: Wang, Y., et al., Phys. Fluids, in press, http://doi.org/10.1063/5.0010168

[1]This work is supported by JCESR, an Energy Innovation Hub funded by the U.S. D.O.E.

Yilin Wang
University of Illinois at Urbana-Champaign

Date submitted: 03 Aug 2020 Electronic form version 1.4