Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Defining dimensionless parameters for electrohydrodynamic field-directed nanowire assembly.[1] RUSTOM BHILADVALA, University of Victoria, MAHSHID SAM, QuirkLogic Inc. — We present an approach for defining dimensionless parameters based on competing forces on nanoparticles in an electrohydrodynamic assembly process. These forces can either direct or disrupt the assembly process in different assembly situations. We define dimensionless parameters to maximize the ratio of directive to disruptive forces. This work is motivated by promising scientific capabilities that have been demonstrated using nanostructured devices at laboratory scale. Their translation to useful devices over centimeter to meter squared area at reasonable cost, can be facilitated by methods of field-directed assembly of nanostructures. Capillary and viscous forces, dielectrophoresis and dipole-dipole interaction, electrode polarization and electroosmosis, are involved during assembly. These depend on values of physical properties of the nanoparticles and the suspension fluid, design of the electrode pattern and the potential and frequency chosen for the electric field. The value of some of these physical parameters can each simultaneously affect forces that direct and disrupt nanostructure assembly. The tedious trial and error involved in parameter selection is an impediment to nanomanufacturing. A systematic approach to eliminate it is the motivation for this work.

[1]Support from funding agencies NSERC, MITACS.

Rustom Bhiladvala
University of Victoria

Date submitted: 01 Aug 2019 Electronic form version 1.4