Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Electrohydrodynamic Printing on Flat and Uneven Surfaces SEPEHR MAKTABI, PAUL CHIAROT, State Univ of NY - Binghamton — In electronics manufacturing, the need for high resolution patterns can be met by generating fine droplets using materials printing techniques. Other desirable features are high print speeds, high frequency droplet generation, and large stand-off distances. In this work, an array of emission modes for a tunable electrohydrodynamic (EHD) printing method is reported. Among these, the promising micro-dripping mode generated droplets an order of magnitude smaller than the nozzle's inner diameter at a frequency range of 2-8 kHz. This method is applied to print organic resistors using the conductive ink poly(3,4-ethylenedioxythiophene)-poly(styrenesulfonate)(PEDOT:PSS). They were printed on flat and uneven substrates at speeds up to 50 mm/s. They had a width from 50 to 500 um and resistance from 1 to 70 Ω/um. The effect of supply flow rate, applied voltage, stand-off distance, and target substrate material properties with respect to droplet generation frequency was investigated. Experimental results reveal that frequency increases nonlinearly with the applied voltage, which is strongly influenced by the non-Newtonian shear thinning effect of PEDOT:PSS. The topology of a 3-dimensional substrate is shown to have a significant effect on the structure and function of a printed resistor.

Sepehr Maktabi
State Univ of NY - Binghamton

Date submitted: 01 Aug 2015 Electronic form version 1.4