Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Experimental Analysis of Spray Atomization for Targeted Deposition of Nanoparticles SHADI SHARIATNIA, Texas A&M University, FARZAD POURSADEGH, Georgia Institute of Technology, AMIR ASADI, DORRIN JARRAHBASHI, Texas A&M University, A&M-GT COLLABORATION, A&M-GT COLLABORATION — Targeted delivery of nanoparticles has a wide range of applications in electronics, pharmaceuticals, and advanced manufacturing. A novel process that deposits cellulose nanocrystals (CNC) on a silicon wafer has been introduced. CNC-containing droplets were generated by injecting aqueous suspension of CNC through an air-atomized nozzle, where a high-pressure liquid jet undergoes severe instabilities due to the large pressure drop between the injector and ambient atmospheric conditions. High-speed diffuse back illumination (DBI), laser diffraction techniques and scanning electron microscopy (SEM) are employed to visualize and quantify the effects of spray parameters on nanoparticles distribution. The liquid jet breaks up into ligaments that later form large number of micron-size droplets at a small distance downstream of the nozzle that further evaporate and release nanoparticles on the targeted surface. Controlling process parameters such as pressure and temperature of the injected and ambient medium, characteristics of the nozzle and rheology of the aqueous nanoparticle suspension directly impacts the droplet size distribution and hence dispersion and distribution of nanoparticles.

Dorrin Jarrahbashi
Texas A&M

Date submitted: 16 Sep 2019 Electronic form version 1.4