Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Effect of strong electric field on plasma-enhanced catalytic growth of carbon nanofibers XUEWEI ZHANG, Texas A&M Univ, King, MIKHAIL SHNEIDER, Princeton University, ZHANG-SHNEIDER TEAM — There has been much previous work on the kinetics of carbon nanofiber (CNF) growth via plasma enhanced chemical vapor deposition (PECVD). In contrast, very few modeling and computational studies have been devoted to the dynamics of CNF growth starting from catalyst nanoparticles on a substrate. Our paper contributes to the development of such a modeling framework which can be used to reveal various dynamic aspects of the process. To be more specific, in this work, we consider the effect of strong electric field in the vicinity of the catalyst nanoparticle. Based on two recent papers, the inclusion of electric field causes an increase in the flux of neutral molecules to the nanoparticle which in turn speeds up the growth process. When the CNF grows to such a length that field emission becomes strong, the resultant heating effect will significantly raise the nanoparticle temperature, which may slow down and eventually turn off the CNF synthesis. This could be a termination mechanism of CNF growth via PECVD, as an alternative to the traditional catalyst poisoning mechanism.

Xuewei Zhang
Texas A&M Univ, King

Date submitted: 14 Jun 2018 Electronic form version 1.4