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Plasma deposition of metal catalyst nanoparticles and carbon nanotubes: a KMC study IGOR LEVCHENKO, The University of Sydney, KOSTYA OSTRIKOV, PLASMA NANOSCIENCE TEAM — In this work, the formation of metal catalyst nanoparticles and growth of carbon nanotubes from a low-temperature plasma environment is studied by kinetic Monte Carlo numerical technique. The numerical simulations were used to model the main surface processes including the carbon diffusion on substrate and nanotube surfaces, metal catalyst saturation with carbon, and formation of the nanotubes on saturated catalyst. We demonstrate that control of the Ni and carbon influxes from plasma provides a very effective control of the surface processes, and eventually results in the formation of arrays of densely-packed metal catalyst nanodots and effective growth of single-wall nanotubes. The use of plasma of higher degree of ionization provides more uniform saturation of metal catalyst nanoparticles with carbon, and thus results in the formation of uniform array of the carbon nanotubes. We also demonstrate that the nano-structured electric fields near the substrate surface covered with growing nanotubes play a very important role in the growth, thus providing an additional effective tool for the growth control.

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