Abstract Submitted
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In situ diagnostics of the pulsed growth of graphene and carbon nanotubes DAVID GEOHEGAN, ALEX PURETZKY, JASON READLE, CHRISTOPHER ROULEAU, MURARI REGMI, GYULA ERES, GERD DUSCHER, MINA YOON, Oak Ridge National Laboratory, OAK RIDGE NATIONAL LABORATORY TEAM — Non-equilibrium, pulsed gas delivery and pulsed heating synthesis approaches are used to explore and compare the kinetics and mechanisms of carbon nanotube and graphene growth on metal thin-films. Time-resolved, in situ optical reflectivity of growing nanotubes and graphene reveal the growth kinetics resulting from well-controlled, pulsed fluxes of acetylene by chemical vapor deposition. Alternatively, pulsed laser heating of substrates is used to provide well-defined transient growth temperature profiles for growth by chemical vapor deposition. Pulsed gas fluxes are shown to control the density and diameter of nanotubes in vertically-aligned nanotube arrays with nanoparticles of different size repeatedly nucleating, growing, and terminating growth in accordance with an empirical growth model. The pulsed processing approach is used to grow vertically aligned nanotube arrays with variable density. Research sponsored by the Materials Science and Engineering Division, Basic Energy Sciences, U.S. Department of Energy. A portion of this research was conducted at the Center for Nanophase Materials Sciences, which is sponsored at Oak Ridge National Laboratory by the Scientific User Facilities Division, U.S. Department of Energy.

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