Abstract Submitted
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Numerical Modeling of a Pulsed Argon-Silane RF Plasma with Biased Substrate for High-Velocity Deposition of Nanoparticles[1] STEVEN GIRSHICK, CARLOS LARRIBA-ANDALUZ, Dept. of Mechanical Engineering, University of Minnesota, Minneapolis, MN — It has been hypothesized that deposition of very small silicon nanoparticles during plasma-enhanced chemical vapor deposition of silicon, under conditions where the particle impact velocity is high enough to cause particle melting/amorphization, can lead to epitaxial film growth at low temperature [1]. One way to accomplish this might be by pulsing the RF plasma and applying a positive DC bias during the afterglow of each pulse. The negatively charged particles, trapped in the plasma during the ON phase of each pulse, are accelerated to the substrate during the afterglow. To assess the feasibility of such an approach, we conducted numerical simulations of a pulsed capacitively-coupled RF Ar-silane plasma. We used a modified version of a previously reported 1D model, in which a nanodusty plasma is simulated by self-consistently coupling models for the plasma, chemistry and aerosol [2]. Preliminary results indicate that the approach is feasible, but that parameters such as pulse frequency and duty cycle are important in limiting particle growth and in maximizing fluxes of energetic nanoparticles to the substrate. [1] P. Roca i Cabarrocas, R. Cariou and M. Labrune, J. Non-Cryst. Sol., 358, 2000 (2012). [2] P. Agarwal and S. L. Girshick, Plasma Chem. Plasma Process. 34, 489 (2014).

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