Abstract Submitted
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Coagulation in a Nanodusty Plasma[1] STEVEN GIRSHICK, LAVANYA RAVI, Dept. of Mechanical Engineering, University of Minnesota — We recently reported [1] a numerical model and simulations for the spatiotemporal evolution of a parallel-plate RF plasma at 100 mTorr, in which nanoparticles were assumed to nucleate in an initial short burst. These simulations predicted that coagulation did not play a significant role, because neutral particles were rapidly either charged by electron attachment or lost by diffusion to the walls. For the remaining negatively charged particles, coagulation was strongly suppressed by the mutual charge repulsion. In the work reported here, we more realistically allow nucleation to continue wherever the local nanoparticle surface area concentration lies below a critical value. In addition, unlike the previous work [1], we account for the enhancement in coagulation caused by the induced dipole in neutral-charged nanoparticle interactions. The new simulations predict that coagulation does indeed play an important role in particle growth. In particular, most coagulation involves very small (approx. 1 nm in diameter) neutral particles that are scavenged by larger charged nanoparticles near the edges of charged particle trapping regions. [1] S. J. Warthesen and S. L. Girshick, Plasma Chem. Plasma Process. 27, 292 (2007).

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