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Numerical simulations of a nanodusty RF plasma[1] STEVEN GIRSHICK, PULKIT AGARWAL, University of Minnesota — The nucleation, growth, charging and transport of nanoparticles in a low-pressure RF plasma have profound effects on the plasma. In previous work we developed a numerical model for the spatiotemporal evolution of the plasma-nanoparticle system. The model simulates a one-dimensional parallel-plate capacitively-coupled plasma. It includes solutions to electron and ion population balance equations, and Poisson's equation for the electric field, models stochastic particle charging, and self-consistently solves the aerosol general dynamic equation, including particle size- and charge-dependent coagulation (including the effect of image potentials), and particle transport by electrostatic forces, Brownian diffusion, ion drag and thermophoresis. In the present work this model is used to explore the effect of system parameters on the nanoparticle and plasma behavior. Parameters studied include pressure, temperature and temperature distribution, applied voltage and gas flow rate. In addition we examine the behavior of the system at long times, when particles are pushed by ion drag out of the center of the plasma, opening a void that allows fresh nucleation.

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