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Analytical model for the charge and temperature distributions of nanoparticles in a low pressure plasma accounting for ion-neutral collisions FEDERICO GALLI, UWE KORTSHAGEN, University of Minnesota — An analytical model predicting the nanoparticle charge and temperature distributions in a low pressure plasma is developed. The model includes the effect of collisions between ions and neutrals in proximity of the particles. In agreement with experimental evidence for pressures of a few Torr a charge distribution that is less negative than the prediction from the collisionless orbital motion limited theory is obtained. Under similar plasma conditions an enhanced ion current to the particle is found. Ion-electron recombination at the particle surface, together with other particle heating and cooling mechanisms typical of silane-argon plasmas, is included in a particle heating model which predicts the nanoparticle temperature distribution. The effect of plasma parameters on the nanoparticle temperature distribution is discussed and the predictive power of the model is demonstrated against experimental evidence of temperature induced crystallization of silicon nanoparticles.

Federico Galli
University of Minnesota

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