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Modeling the dynamics of nanoparticle charging in pulsed plasmas[1] UWE KORTSHAGEN, TOSHISATO ONO, University of Minnesota-Twin Cities, Mechanical Engineering — Studies focusing on the influence of dust particles on a discharge afterglow are scarce. In general, after the power source is removed, the electron temperature decreases rapidly on a time scale of the energy relaxation time, typically on the scale of microseconds. The electron density is also expected to decrease rapidly via recombination and/or diffusion losses to the boundaries. However, if electron detachment from the particles is a significant process, it can contribute to electron generation in the afterglow. In this study, the evolution of the electron desorption and electron-ion recombination on particle surfaces during the afterglow was investigated through modeling. The electron binding energy to the charged particle surface and the electron desorption rate were evaluated using quantum mechanical calculations by Bronold et al. [Contrib. Plasm. Phys., 49, 4-5, 303-315 (2009)]. The model suggests that electron detachment from particles can lead to a momentary increase of the electron density in the afterglow of pulsed dusty plasmas.

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