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Plasma diagnostics of a plasma for silicon nanocrystal synthesis[1]
ZICHANG XIONG, TOSHISATO ONO, CHRIS HOGAN, University of Minnesota, JORDYN POLITO, STEVEN LANHAM, MARK KUSHNER, University of Michigan, UWE KORTSHAGEN, University of Minnesota — Nonthermal plasmas are attractive sources for nanomaterials synthesis. As the ability to characterize such plasmas through plasma modeling increases, the need for validating models through targeted experiments increases as well. In this presentation, we present measurements of electron temperatures and ion densities in a flowing argon-silane plasma using double Langmuir probes. Due to the elevated pressures, we apply the modified Talbot and Chou probe theory, which we validate by obtaining almost identical ion densities and electron temperatures measured by three different double probes with different probe tip diameters in different collisional regimes for pressures ranging from 200 mTorr to 2 Torr. Furthermore, relative data of spatial concentration profiles of radical densities are derived from the thickness of films deposited on sample targets that are positioned at different locations within the plasma. Data of electron temperatures and plasma densities are compared to results of a global plasma model and solutions of the electron Boltzmann equation. Radical species profiles are compared to results of a two-dimensional plasma model for flowing argon-silane plasmas.

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