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Measurement of plasma density and electron energy distribution function in a filamented capacitively coupled silane-argon plasma[1] AMEYA BAPAT, UWE KORTSHAGEN, University of Minnesota — A capacitively coupled, filamented argon-silane plasma is studied. This discharge has been shown to produce highly monodisperse, facetted, cube shaped silicon nanocrystals which were previously successfully used in novel single nanoparticle vertical Schottky barrier transistors. The striated filament has a diameter of about 3 mm and rotates erratically in the 5 cm inner diameter discharge tube at a frequency of about 150 Hz. The plasma is run at a pressure of ∼2 Torr in 5% silane diluted in helium and argon. RF power up to 200 W is applied at 13.56 MHz. A capacitive probe (Braithwaite et al., Plasma Sources Sci. Technol., vol. 5, 677 (1996)) is used to measure the ion density within the filament and the background plasma. Emission and absorption spectroscopy combined with a model based on a Boltzmann solver and a collisional-radiative model for argon-silane are used to determine the electron energy distribution function. We expect that a better understanding of the plasma process will help to understand the formation of silcon nanocrystals with the unique cubic shape.

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