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Impact of Wafer Bias in an Inductively Coupled Plasma Reactor PRASHANTH KOTHNUR, ANANTH BHOJ, Novellus Systems, Inc., XIAOHUI YUAN, Esgee Technologies Inc., LAXMINARAYAN RAJA, The University of Texas at Austin — Inductively Coupled Plasma (ICP) reactors such as the Novellus SPEED HDP-CVD product enable void-free dielectric deposition in high-aspect ratio trenches for microelectronics fabrication. The physical phenomena involves production of a high-density plasma by the inductive coils and charged species extraction and high-energy impact at the biased wafer surface. The talk will present a simulation study of an ICP discharge in a dome-shaped reactor with different bias voltage waveforms on the wafer surface. The waveforms considered include different shapes (e.g. sinusoidal, triangular) and pulsed bias waveforms. The distribution of species fluxes and Ion Energy Angular Distribution functions at the wafer will be presented. The study will use VizGlow, an unstructured, mixed-mesh plasma simulator. Simulations are performed in two steps. First, the power deposition due to the inductive coils is simulated to steady-state with the assumption of a quasi-neutral plasma with ambipolar transport of charged species in the presence of an unbiased surface. The simulation is subsequently continued in the self-consistent mode using the Poisson equation to determine the electric field in the vicinity of the surface. Secondary power deposition and plasma generation owing to the applied bias is simulated self-consistently.

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