Abstract Submitted
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Consequences of E-H transitions in Impendence Matching of Pulsed Inductively Coupled Plasmas[1] CHENHUI QU, STEVEN LANHAM, PENG TIAN, University of Michigan , CARL SMITH, KRISTOPHER FORD, JOEL BRANDON, STEVEN SHANNON, North Carolina State University, MARK J. KUSHNER, University of Michigan — Pulsed inductively coupled plasmas (ICPs) are used for selective etching in microelectronics fabrication. Due to disparities in the input impendence of the plasma reactor and the output impedance of the power supply, impedance matching networks (IMN) with variable capacitors are used to maximize transmitted power into the plasma. During a pulsed cycle, the impedance of the ICP can change faster than the capacitors in the IMN can be adjusted, resulting in power to the ICP being unmatched for part of the cycle. In halogen gases, the electron density during the inter-pulse afterglow can decrease by factors of 10-100 resulting in the next power-pulse beginning with an E-H (electrostatic-inductive) transition. The change in reactance of the ICP during the E-H transition further challenges impedance matching. Results from a computational investigation of impedance matching to pulsed ICPs sustained in Ar/Cl_2 at 10s mTorr will be discussed for conditions where an E-H transition occurs at power-on. IMN and transmission line models were interfaced to the Hybrid Plasma Equipment Model for these conditions. IMN settings were chosen to best match the pulse at different times during the cycle – early matching emphasized power deposition in the E-mode and late matching emphasized the H-mode.

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