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Study of Pulsed vs. RF Plasma Properties for Surface Processing Applications RICKY TANG, MATTHEW HOPKINS, EDWARD BARNAT, Sandia National Laboratories, PAUL MILLER, Retired — The ability to manipulate the plasma parameters (density, E/N) was previously demonstrated using a double-pulsed column discharge. Experiments extending this to large-surface plasmas of interest to the plasma processing community were conducted. Differences between an audio-frequency pulsed plasma and a radio-frequency (rf) discharge, both prevalent in plasma processing applications, were studied. Optical emission spectroscopy shows higher-intensity emission in the UV/visible range for the pulsed plasma comparing to the rf plasma at comparable powers. Data suggest that the electron energy is higher for the pulsed plasma leading to higher ionization, resulting in increased ion density and ion flux. Diode laser absorption measurements of the concentration of the 1S5 metastable and 1S4 resonance states of argon (correlated with the plasma E/N) provide comparisons between the excitation/ionization states of the two plasmas. Preliminary modeling efforts suggest that the low-frequency polarity switch causes a much more abrupt potential variation to support interesting transport phenomena, generating a "wave" of higher temperature electrons leading to more ionization, as well as "sheath capture" of a higher density bolus of ions that are then accelerated during polarity switch.

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