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Voltage slew rate dependence of plasma excitation in 10-200 Torr argon-nitrogen gas mixture DBD FENG LIU, GEORGE HUANG, Center for Advanced Power and Energy Conversion, Department of Mechanical and Materials Engineering, Wright State University, BISWA GANGULY, Air Force Research Laboratory — Argon-nitrogen gas mixture dielectric barrier discharge (DBD) excited by short (rising time$\sim$20 ns) and long (rising time$\sim$100 ns) 3 to 6 kV high-voltage pulses was investigated in the pressure range of 10-200 Torr. Time resolved spectra of Ar ($2P_1$-$1S_2$), Ar^+ (4P-$4D^o$), N_2 ($C^3\Pi_u$ -$B^3\Pi_g$), and N_2^+($B^2\Sigma_u^+$-$X^2\Sigma_g^+$) were recorded while the applied voltage kept constant during measurements; the influence of different applied voltages and nitrogen concentration on the observed spectra were also obtained. Mean electron energies, T_e, were derived from the ratio of the measured emission intensities by comparing excitation rates calculated using BOLSIG+ code, assuming a Maxwellian EEDF. The T_e of short-pulse excited DBD was in the range of 6-8 eV and it decreased by about 0.5 eV for lower voltage slew rate excitation under the same experimental conditions. The pulsed DBD plasma processes with different slew rate were analyzed based on the dependence of observed emission spectra and T_e on the discharge operating parameters. The discharge voltage, current and power deposition were also estimated from applied voltage and current measurements.

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