Abstract Submitted
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Trace-rare-gas optical emission spectroscopy of argon dc glow discharges JASON AFONSO-FERREIRA, LUC STAFFORD, Universite de Montreal — Trace-rare-gas-optical-emission-spectroscopy (TRG-OES) was used to determine the electron temperature, T_e, in a direct-current argon glow discharge with aluminum electrodes. The TRG-OES method is based on a comparison of atomic emission intensities from trace amounts of Ne, Ar, Kr, and Xe added to the plasma, with intensities calculated from a model. In the positive column region, T_e was 0.8 $\pm$ 0.1 eV and was fairly independent of pressure (160 – 500 mTorr) and current (4 - 70 mA). In the negative glow region, the electron temperatures were slightly higher and increased with current, going from 0.9 eV at 4 mA to 1.6 eV at 67 mA for a 200 mTorr Ar plasma. Over the whole range of experimental conditions investigated, the metastable-to-neutral number density ratios were relatively low ($<10^{-6}$) such that rare gas emission lines were excited mostly from the ground state. Therefore, the values of Te determined by TRG-OES were characteristic of the high-energy portion of the electron energy distribution function (EEDF). Overall, the measured values of Te were much lower than those expected from a zero-dimensional global model assuming a Maxwellian EEDF (e.g. 1.9 eV at 200 mTorr). The values were, however, consistent with those predicted by Boltzmann simulations (Boltzig) in the 10-16 eV portion of the EEDF.

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