LASER INDUCED FLUORESCENCE OF THE FERROELECTRIC PLASMA SOURCE ASSISTED HOLLOW ANODE DISCHARGE

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Parameters of the plasma produced by a ferroelectric plasma source (FPS) assisted high-current (~1 kA) hollow anode (HA), low-pressure (10^{-4} Torr) Ar gas discharge were studied using a time- and space-resolved laser induced fluorescence (LIF) diagnostic technique. It was shown that the plasma filling of the HA cavity occurs due to the expansion of the plasma flows generated by the FPSs with a gradual time-dependent increase in the plasma density along the length of the HA cavity. These data were verified by the results of 1D modeling of the plasma expansion in vacuum and time-dependent collisional-radiative modeling. Also, LIF diagnostics, which was tested on the saturation effect both experimentally and numerically, showed that the plasma ion temperature gradually increases during the discharge reaching ~9 eV at its end. Various phenomena (plasma kinetic instabilities, charge-exchange processes during the plasma ion interaction with the HA walls and the model of neutral atoms ionization inside the Debay's sphere) which could be responsible for such ion temperature were considered.