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Spatiotemporal structure of electron density inside atmospheric pressure glow discharge measured by spectroscopic methods KEIICHIRO URABE, OSAMU SAKAI, Kyoto Univ., KUNIHIDE TACHIBANA, Ehime Univ. — We have investigated discharge mechanisms in an atmospheric pressure glow discharge (APGD) by spectroscopic diagnostics. The APGD was a parallel-plate electrode configuration and generated in He gas with small N_2 impurity. We measured electron density (n_e) distributions by using a combination method of a CO_2-laser heterodyne interferometry and a millimeter-wave transmission. To discuss the formation mechanisms of n_e distribution, we also measured spatiotemporal structures of He metastable atom density by a laser absorption spectroscopy (LAS) method, and calculated a dependence of ionization frequency on the N_2 impurity ratio. The measurement results of the combination method revealed that the spatial n_e distribution was localized near the dielectric barrier, and the distribution was more broaden only at 0.25% of N_2 impurity ratio. In the LAS measurement, we observed a typical structure of glow discharge in the APGD. This result indicates that the localization of n_e distribution is due to the formation of negative glow region. The calculation results of the ionization frequency give us the explanation for the broaden n_e distribution at 0.25% of N_2 impurity ratio, which is the enhanced ionization in the range of lower reduced electric field.

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