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Quantification Approach of Gas Temperate Distribution in Atmospheric Positive DC Glow Discharge Measured by Spectroscopic Imaging
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— In our previous work, a two-dimensional (2D) gas temperature distribution in a positive DC steady-state glow corona was qualitatively measured by spectroscopic imaging. Spectral images of its glow corona were taken using ICCD camera with ultra-narrow band-pass filters, and they were corresponded to the head and tail of a second positive system bands of nitrogen (2PS N_2 (0-2)). The qualitative gas temperature was obtained from the emission intensity ratio (I_{2Ptail}/I_{2Phead}) between the head and tail of 2PS N_2 (0-2). This emission intensity ratio also equals the rotational temperature (T_R), and T_R almost equals the gas temperature (T_G) in atmospheric pressure. In this work, the qualitative 2D gas temperature distribution was derived from 2D I_{2Ptail}/I_{2Phead} plots, and the calibration date of I_{2Ptail}/I_{2Phead} for T_R was accumulated by investigating the relationship between the spatially average absolute gas temperature (T_{av}) obtained by single-point spectroscopic measurement and the average value of I_{2Ptail}/I_{2Phead} plots. On the basis of the calibration date, a spectroscopically-imaged qualitative 2D I_{2Ptail}/I_{2Phead} distribution in a positive DC glow corona was converted to a quantitative 2D image of gas rotational temperature.

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