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Dynamics of dielectric barrier discharge in non-uniform gas composition investigated by laser spectroscopic measurements KEIICHIRO URABE, Department of Electronic Science and Engineering, Kyoto University, YOSUKE ITO, JOON-YOUNG CHOI, OSAMU SAKAI, KUNIHIDE TACHIBANA — It is well known that stable and glow dielectric barrier discharge (DBD) at atmospheric pressure is observed using helium gas and AC high voltage of kHz-order frequency. We have investigated the discharge mechanisms of DBDs from a view point of the spatiotemporal distributions of excited species measured by laser spectroscopic methods. In this presentation, we will show convincing arguments about the discharge model of the DBD especially having the non-uniformity of gas composition. As a DBD plasma source for atmospheric pressure processes, we have investigated an atmospheric pressure plasma jet (APPJ) using helium gas flow in ambient air, and this plasma source can be regarded as the DBD near the boundary interface of helium gas and ambient air. In this APPJ, we observed spatiotemporal distributions of excited species density inside the helium gas channel, using laser absorption spectroscopy and laser induced fluorescence, to measure the densities of helium metastable atom (2^3S_1 state) and nitrogen ion ($X^2\Sigma_g^+$ state) respectively. To study the influence of nitrogen gas contamination on the discharge profile of DBD, we have also applied CO_2-laser heterodyne interferometry to measure the special distribution of electron density in parallel-plate DBD.

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