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Control of ROS and RNS productions in liquid in atmospheric pressure plasma-jet system[1] GIICHIRO UCHIDA, TAIKI ITO, KOSUKE TAKENAKA, JUNICHIRO IKEDA, YUICHI SETSUHARA, Osaka University — Nonthermal plasma jets are of current interest in biomedical applications such as wound disinfection and even treatment of cancer tumors. Beneficial therapeutic effects in medical applications are attributed to excited species of oxygen and nitrogen from air. However, to control the production of these species in the plasma jet is difficult because their production is strongly dependent on concentration of nitrogen and oxygen from ambient air into the plasma jet. In this study, we analyze the discharge characteristics and the ROS and RNS productions in liquid in low- and high-frequency plasma-jet systems. Our experiments demonstrated the marked effects of surrounding gas near the plasma jet on ROS and RNS productions in liquid. By controlling the surround gas, the O_2 and N_2 main plasma jets are selectively produced even in open air. We also show that the concentration ratio of NO_2^- to H_2O_2 in liquid is precisely tuned from 0 to 0.18 in deionized water by changing N_2 gas ratio ($N_2/(N_2 + O_2)$) in the main discharge gas, where high NO_2^- ratio is obtained at N_2 gas ratio at $N_2/(N_2 + O_2) = 0.8$. The low-frequency plasma jet with controlled surrounding gas is an effective plasma source for ROS and RNS productions in liquid, and can be a useful tool for biomedical applications.

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