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Control of plasma-liquid interaction of atmospheric DC glow discharge using liquid electrode¹ NAOKI SHIRAI, RYUTA AOKI, AIHITO NITO, TAKUYA AOKI, SATOSHI UCHIDA, FUMIYOSHI TOCHIKUBO, Tokyo Metropolitan University — Atmospheric plasma in contact with liquid have a variety of interesting phenomena and applications. Previously, we investigated the fundamental characteristics of an atmospheric dc glow discharge using a liquid electrode with a miniature helium flow. We tried to control the plasma-liquid interaction by changing the plasma parameter such as gas species, liquid, and applied voltage. Sheath flow system enables another gas (N_2, O_2, Ar) flow to around the helium core flow. It can control the gas species around the discharge. When liquid (NaCl aq.) cathode DC discharge is generated, Na emission (588 nm) can be observed from liquid surface with increasing discharge current. Na emission strongly depends on the discharge current and liquid temperature. However, when Ar sheath flow is used, the intensity of Na becomes weak. When liquid anode DC discharge is generated, self-organized luminous pattern formation can be observed at the liquid surface. The pattern depends on existence of oxygen gas in gap. By changing the oxygen gas ratio in the gap, variety of pattern formation can be observed. The discharge in contact with liquid also can be used for synthesis of metal nanoparticles at plasma-liquid interface. Size and shape of nanoparticles depend on discharge gases.

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