Influence of liquid temperature on the characteristics of atmospheric DC glow discharge using liquid electrode with miniature He flow  

NAOKI SHIRAI, KOSUKE ICHINOSE, YUSUKE HASHIZUME, SATOSHI UCHIDA, FUMIYOSHI TOCHIKUBO, Tokyo Metropolitan University, TOKYO METROPOLITAN UNIVERSITY TEAM — An atmospheric DC glow discharge using liquid (electrolyte: NaCl solution) electrodes and axial miniature helium flow was generated stably in ambient air. When the discharge current was increased further, yellow light emission which was originated from sodium atoms vaporized from the electrolyte surface was observed in the negative glow region. To examine the effect of temperature of liquid electrode, we controlled the electrolyte cathode temperature using injection type cooler or heater. The intensity of the sodium emission decreased with the refrigerated electrolyte cathode, while it increased with the heated electrolyte cathode. When we use pulse modulated DC voltage, the sodium emission appeared with a delay time from the start of the discharge, while the emission of nitrogen molecular lines appeared and reached their peaks immediately. The temperature of liquid cathode is important factor to control the plasma-liquid interaction from the discharges and to resolve the detailed mechanism of the electrolyte cathode discharges.

1This work was supported financially in part by a Grant-in-Aid for Scientific Research on Innovative Areas (No 21112007) and a Grant-in-Aid for Young Scientists (Start-up) (No 21840042).