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Simulation of Atmospheric Pressure DC Glow Discharge along a Helium Miniature Gas flow in Air[1] FUMIYOSHI TOCHIKUBO, NAOKI SHIRAI, SATOSHI UCHIDA, Tokyo Metropolitan University — Recently, atmospheric pressure nonthermal plasmas are widely studied for material processing, pollution control technology, and so on. When we use a noble gas flow in air, atmospheric pressure nonthermal plasma is easily obtained along the gas flow line. In these plasmas, the spatial distribution of the gas composition is important factor to determine the plasma property. In this work, we carried out the numerical simulation of atmospheric pressure dc glow discharge with helium gas flow in nitrogen by two-dimensional fluid model. The discharge is generated along helium gas flow between parallel electrodes. The calculated discharge profile is very similar to that observed in the experiment. The discharge clearly has cathode sheath and positive column. The sheath thickness was about 60 μm, and the plasma density was on the order of 10^{12} cm^{-3}. The contribution of Penning ionization was comparable to electron impact ionization. The discharge volume is confined by the increase of nitrogen ratio. The plasma profile reflects the helium distribution because mixture of nitrogen drastically decreases the electron energy.

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