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Simulation of inductive flow controlled by using Microplasma Actuator KAZUO SHIMIZU, Organization for Innovation and Social Collaboration, Shizuoka University, AKIHIKO ITO, Graduate school of engineering, Shizuoka University, MARIUS BLAJAN, Organization for Innovation and Social Collaboration, Shizuoka University, HITOKI YONEDA, Institute for Laser Science, The University of Electro-Communications — Plasma actuator is a novel device for flow control because it has many advantages such as simple construction, no moving part, and quick response. In this study, microplasma actuator with four independent channels was used to generate upward and downward flow. The discharge gap was set at 25 μm, enabling the discharge to occur at the voltage of about 1 kV. Due to low discharge voltage the applied high-voltage could be controlled using FET switches easily. This enables to generate flexible flow. When a AC voltage of 1.4 kV and 20 kHz was applied, 0.6 m/s upward flow and 0.2 m/s downward flow were obtained. The numerical simulation using Suzen model was also carried out to investigate the flow velocity near the electrode surface since flow observation was difficult due to the reflected light from electrodes in PTV. In the simulation, we confirmed that the intensity of upward and downward flow was close to that in experiments. After applying a AC voltage for 2.5 ms, flow control was not finished, and considered to be the transient state. Vortices with the height of about 1.5 mm were occurred in both cases of experiments and the numerical simulations. On the other hand, after driving for 60 ms, the vortex development stopped and this stage was considered to be the steady state.

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