

Characteristics of ionic wind induced by multi-electrode microplasma

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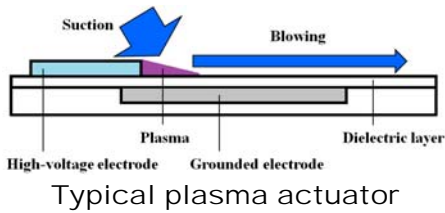


Atmospheric non-thermal plasma has attracted much attention as future flow control device, called dielectric barrier discharge (DBD) plasma actuator. In, this study, flow direction control was carried out by using multi-electrode system and FET switches. Four types flow were observed (right, left, up, and down). Induced flow velocity was about 1 m/s.

1. Objectives

More flexible flow control by using multi-electrode microplasma actuator

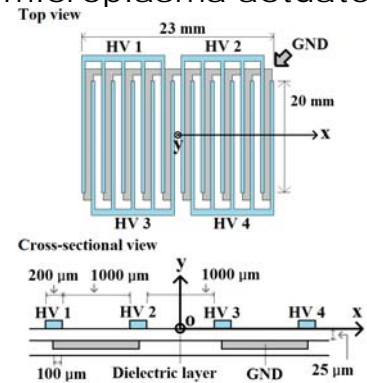
Future flow control device
"Plasma actuator"



For more active flow control

- Multi-electrode
- Micron-scale

We have developed multi-electrode microplasma actuator



Plasma actuator with multi-electrode

Advantages

- No-moving parts
- Simple construction
- Fast response

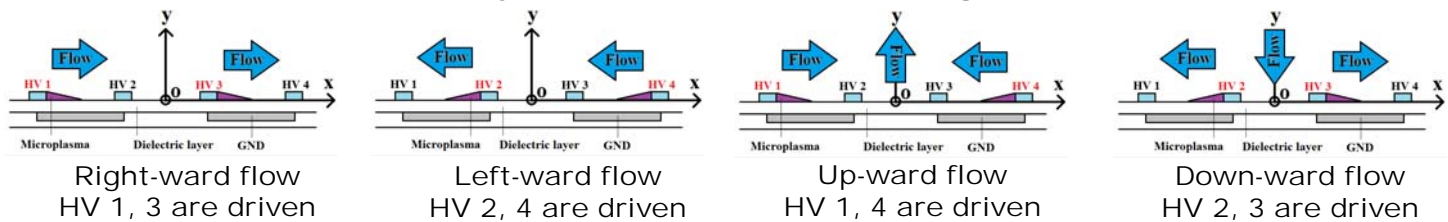
2. Experimental setup

Flow velocity distribution was measured by Particle Tracking Velocimetry (PTV).

Experimental condition

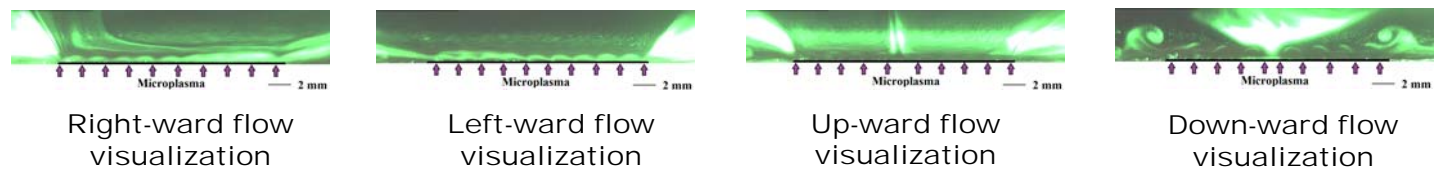
- AC voltage: sinusoidal 1.4 kV 18 kHz
- Power consumption: 4 W

Four types flows were investigated

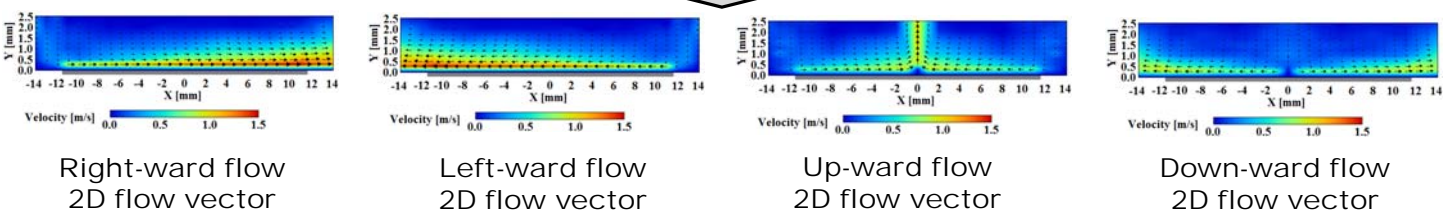


3. Results

(1) Flow visualization



(2) 2D flow vector



4. Conclusions

1. By driving four independent electrodes selectively, flow direction could be controlled (right, left, up, and down). Induced flow velocity was about 1 m/s.
2. Stagnation point (flow velocity = 0 m/s) was observed in case of up, down-ward flow owing to the symmetric electrode configuration and boundary condition.