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Study of plasma induced flow forming mechanism using the Schlieren method NAOHIKO SHIMURA, MOTOFUMI TANAKA, KIYOYUKI AMEMORI, HIROYUKI YASUI, Toshiba Corporation — As one of the active flow control device, a non-thermal dielectric barrier discharge plasma actuator is well known and paid attention. However, the effect of applied voltage waveform to the spatial distribution of the electric discharge and induced flow is not understood. We visualized spacio-temporal evolution of an air density due to the induced flow by Schlieren imaging method with high speed camera, and discuss the relationship between the time variation of applied voltage dV/dt and induced flow. Sinusoidal and triangular waveform voltages were applied to the plasma actuator. It was observed that induced flow was formed with phase of $dV/dt<0$ of sinusoidal voltage waveform. In the case of triangular voltage waveform, it found that the induced flow is faster with increasing the time of $dV/dt<0$ in one cycle. These phenomena can be considered as follows. In the phase $dV/dt>0$, the streamer easily progresses to the dielectric surface, and the dielectric surface is charged up immediately and electric field is weakened by the surface charge, and then induced flow is not formed. On the other hand, in the case of $dV/dt<0$, because streamer is difficult to progress, the electric field to accelerate the positive ions is not cancelled with surface charge.

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