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Time resolved Schlieren imaging of DBD actuator flow fields

CYRUS NOURGOSTAR, LUTFI OKSUZ, NOAH HERSHKOWITZ, University of Wisconsin Madison — Schlieren imaging methods measure the first derivative of density in the direction of a knife-edge spatial filter. It has been used extensively in aerodynamic research to visualize the structure of flow fields. With a single barrier planer dielectric barrier discharge (DBD) actuator, Schlieren images clearly show the absence of significant vertical air flow normal to the surface, and no more than few millimeters thick induced boundary layer flow. A gated intensified CCD camera along with a Schlieren system can not only visualize the flow field induced by the actuator, but also temporarily resolve the images of the flow and plasma field. Our time resolved images with triangular applied voltage waveforms indicate that several separate discharge regimes occur during positive and negative going half cycles of single and double barrier DBD actuators. Time resolved Schlieren imaging of both single and double barrier DBDs with different applied waveforms, discharge parameters and electrode geometries reveal important information on the induced flow structure.

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