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Numerical investigation of pulsed-driven DBD plasma actuator ALEXANDRE LIKHANSKII, Tech-X Corporation, MIKHAIL SHNEIDER, RICHARD MILES, Princeton University, SERGEY MACHERET, Lockheed Martin — Dielectric barrier discharge (DBD) plasma actuators are promising devices for flow separation control. The operation of conventional DBDs, driven by AC or pulses+bias voltage, is based on direct induction of momentum into boundary layer by transferring momenta from charged particles to neutrals. However, the maximum DBD induced flow velocity for the conventional DBD is limited to ∼10-20 m/s, since conventional DBD operates in corona regime. The way to overcome this limitation is to use ns pulses, which transfer much more momentum to the flow during discharge propagation (forward breakdown), as driving voltage. However, on the back slope of the ns pulse, the backward breakdown induces strong negative force on the gas, significantly decreasing to effect of forward pushing. The second problem is the surface charge accumulation, which is reported to be one of the major limiting factors for pulsed DBDs. In this talk, we will present numerical simulations of both forward and backward breakdowns for DBD plasma actuators using 2D/3D hybrid plasma simulation tool VORPAL. We will also discuss potential solutions for the backward breakdown elimination.

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