ENERGY DISTRIBUTION IN THE DIELECTRIC BARRIER DISCHARGE SYSTEM AT LOW PRESSURES

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Using the example of the simplest linear symmetric actuator, the resonance characteristics of the discharge and the system as a whole were determined depending on the geometry of the actuator and air pressure. Resonance curves are plotted for a symmetric actuator with exposed electrodes 15 cm long and 6,5 cm apart at various pressures in the pressure chamber. The discharge efficiency was measured at various values of pressure, length of exposed electrodes, and a fixed output power of the source equal to 30 W. The capacity and quality factor of the "power supply - actuator - DBD" system are determined. The analysis of the ratio of the power consumed for producing a synthetic jet to the power consumed for auxiliary processes is carried out. The mechanical power is assessed and its dependence on pressure is plotted.

The discharge efficiency increases with a decrease in pressure in the pressure chamber and with an increase in the length of the exposed electrodes. With a decrease in pressure, the resonance amplitude of the voltage on the exposed electrodes decreases, thus, the system is restructured to accommodate the changing capacitance, which increases significantly. When the pressure in the pressure chamber decreases from 760 to 150 Torr, the mechanical power increases in 1,6 times, which is consistent with the corresponding decrease in the quality factor and is in agreement with the analysis performed. It is shown that with a decrease in pressure, the energy consumption for producing a synthetic jet increases. This result shows the possibility of using DBD actuators at high altitudes as elements of active control of the flow around the wing of an aircraft.