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Pulsed Nanosecond Discharge Development and Production of Active Particles EVGENY MINTOUSOV, AINAN BAO, WALTER R. LEMPERT, IGOR V. ADAMOVICH, Department of Mechanical Engineering, The Ohio State University — Pulsed nanosecond discharges are being actively used for different engineering applications such as plasma-assisted ignition, plasma flow control, and gas dynamics lasers. The main advantages of using of this type of discharge are (i) efficient production of active particles, and (ii) sustaining uniform, volume filling plasmas at high pressures and power loadings. In the present work, development of a nanosecond pulse discharge (pulse amplitude up to 40 kV, pulse repetition rate up to 100 kHz, pulse duration of 4 ns) was studied at different pressures. Discharge parameters, such as fast ionization wave amplitude and velocity have been measured. Energy input into the flow was also determined. Active particle production in high-speed combustible flows (up to 100 m/s) was estimated by comparing heating of air-fuel flow and air flow in the discharge. The results suggest that additional heat release in air-fuel flows is due to plasma chemical fuel oxidation reactions, which at certain conditions leads to ignition. Kinetic model describing production of active particles in the discharge, subsequent plasma chemical reactions, and ignition process is developed.

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