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Simulation of Nanosecond Repetitively Pulsed Discharges in Air for Plasma Assisted Combustion FABIEN THOLIN, ZDENEK BONAVENTURA, JAROSLAV JANSKY, ANNE BOURDON — Recently, the potential of nanosecond repetitively pulsed discharges for plasma assisted combustion has been demonstrated experimentally. However, synergy effects of successive pulses are not clearly understood so far. In this work, 1D and 2D simulations of point to point discharges have been conducted in air at atmospheric pressure to study these synergy effects. In particular, we have studied the influence of electrode geometry, pulse frequency and applied voltage on the successive discharges. In 1D simulations, the discharge is assumed to be homogeneous on the discharge axis and then 1D radial simulations are used to simulate a significant number of pulses to study the conditions to obtain a discharge in steady-state. 2D calculations present some challenging numerical problems, due to the very different temporal and spatial scales involved in the discharge and post-discharge phases. Then, we have carried out 2D simulations of two pulses at high frequency. A simple chemistry model is taken into account in the simulations to compute the optical emissions of the discharge and the production of excited species and atoms as atomic oxygen, a key species for plasma assisted combustion.

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