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Study of nanosecond discharges in different H_2 air mixtures at atmospheric pressure for plasma-assisted applications[1] ANNE BOURDON, SUMIRE KOBAYASHI, LPP, UMR 7648, Ecole Polytechnique, route de Saclay, 91128 Palaiseau Cedex, France, ZDENEK BONAVENTURA, Department of Physical Electronics, Faculty of Science, Masaryk University, Brno, Czech Republic, FABIEN THOLIN, ONERA, DMPH Department, 29 avenue de la Division Leclerc, 92322 Châtillon cedex, France, NIKOLAY POPOV, Skobel'tsyn Institute of Nuclear Physics, Moscow State University, Leninskie gory, Moscow 119991, Russia — This paper presents 2D simulations of nanosecond pulsed discharges between two point electrodes in different H_2/air mixtures and in air at atmospheric pressure. A fluid model is coupled with detailed kinetic schemes for air and different H_2/air mixtures to simulate the discharge dynamics. First, as the positive and negative ionization waves propagate in the interelectrode gap, it has been observed that in H_2/air mixtures with equivalence ratios between 0.3 and 2, major positive ions produced by the nanosecond discharge are N_2^+, O_2^+ and HN_2^+. The discharge dynamics is shown to vary only slightly for equivalence ratios of the H_2/air mixture between 0.3 and 2. Then, as the discharge transits to a nanosecond spark discharge, we have studied the different chemical reactions that lead to fast gas heating and to the production of radicals, as O,H and OH. Both thermal and chemical effects of the nanosecond spark discharge are of interest for plasma assisted combustion applications.

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