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Optical diagnostics of nanosecond capillary discharge in pure CO2 at high values of deposited energy and reduced electric field.¹ GEORGY POKROVSKIY, OLIVIER GUAITELLA, ANA SOFIA MORILLO-CANDAS, Laboratory of Plasma Physics, Ecole Polytechnique, Palaiseau, France, ELENA FILIMONOVA, Joint Institute for High Temperatures RAS, Moscow, Russia, SVETLANA STARIKOVSKAIA, Laboratory of Plasma Physics, Ecole Polytechnique, Palaiseau, France — Optical and electrical diagnostics of nanosecond discharge ignited in pure CO_2 at moderate (10-20 mbar) pressures was performed. The reduced electric fields of 250-300 Td and the electric current of 130 A were registered after the passing front of the fast ionization wave. The absolute downstream densities of CO_2 dissociation products were measured by FTIR. The values of CO_2 dissociation fraction of 20% at single pulse regime and 90% at 300 Hz repetition rate have been obtained. The gas temperature measurements were performed by the means of OES in $CO_2:N_2$ mixtures. The following values of the gas temperature were derived: 450 K, 1700 K and 2000 K in 1st, 2nd and the 3rd pulses separated by 200 ns. Numerical modelling of the discharge has shown that the vibrational kinetics is not dominant in the case of high electric fields. Instead, excitation of electronic levels of CO₂ with their consequent dissociation onto CO and O and dissociative recombination of electrons with CO_2^+ ions play the leading role. The sensitivity and the rate analysis of the kinetic scheme have been done.

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