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Vibrational excitation and temperature evolution in a pulsed CO2 discharge OLIVIER GUAITELLA, ANA-SOFIA MORILLO-CANDAS, DAVID YAP, CYRIL DRAG, JEAN-PAUL BOOTH, Laboratory of Plasma Physics, CNRS, Ecole Polytechnique, UPMC, Universit Paris-Saclay, 91128 Palaiseau, France, BART KLARENAAR, RICHARD ENGELN, Department of Applied Physics, Eindhoven University of Technology, Eindhoven, The Nether- lands, MARIJA GROFULOVIC, TIAGO SILVA, VASCO GUERRA, Instituto de Plasmas e Fuso Nuclear, Instituto Superior Tecnico, Universidade de Lisboa 1049-001 Lisboa, Portugal — In spite of the abundant literature on CO2 lasers, many energy transfer coefficients are still missing to accurately describe the vibrational kinetic in CO2 and CO2 containing plasmas that are investigated for CO2 recycling technologies. A set of complementary measurements is performed in a simple pulsed glow discharge in order to provide constraints to kinetic models of such plasmas. Time resolved in situ FTIR is used to obtain vibrational temperature of CO2 and CO during plasma pulses and the afterglow. High spectral resolution TALIF gives simultaneously O atoms density and also their temperature from the Doppler broadened profile of the fluorescence line of O atoms. The time evolution of gas temperature is obtained from Raman scattering measurements. The knowledge of gas temperature, vibrational temperature, radical and molecules densities, and electric field in the same plasma cell allow exhibiting the influence of surface properties on the plasma dynamics as well as detailed comparison with kinetic modeling of the gas phase. In addition of pure CO2 plasma, several experiments are carried out in CO2/N2 and CO2/CH4 in contact with catalytic materials for molecules synthesis purpose.

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