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Mechanisms of CO2 CH4 plasma conversion in low pressure RF discharges investigated with multiple in situ time resolved diagnostics¹ EDMOND BARATTE, ANA SOFIA MORILLO CANDAS, CAROLINA GAR-CIA SOTO, HENRIQUE RODRIGUES, OLIVIER GUAITELLA, Laboratoire de Physique des Plasmas, Ecole Polytechnique-CNRS-Sorbonne Universit 91128, Palaiseau, France, LPP TEAM — The Dry Reformation of Methane (DRM), a process converting CO2 and CH4 into value-added products (CO2 (g) + CH4(g) \rightarrow 2CO(g) + H2(g), is a promising lead in the research of efficient energy storage. However, though CO2 plasmas are widely studied for CO2 conversion, the molecule synthesis mechanisms in CO2-CH4 plasmas remain poorly known. The goal of this work is to provide experimental data allowing a detailed description of CO2-CH4 plasma kinetic, both in DC glow and in RF discharges, to develop kinetic models coupling electron, vibrational and chemical kinetic processes. To this aim a dedicated reactor at low pressure, in both flowing and static conditions (without any gas flow), has been used in which relevant parameters (gas temperatures, conversion rates, electric field). The vibrational temperatures of CO and CO2 are measured in situ with FTIR spectroscopy by fitting infrared spectras. FTIR spectroscopy is also used to monitor the appearance of CO2-CH4 conversion products in static conditions. Densities of atomic short-lived species such as O are measured in the plasma with actinometry by addition of small amounts of Ar in the CO2-CH4 mixture. Finally, the reduced electric field is estimated with the ratio of atomic emission line.

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