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Level-lumping method for the modeling of CO_2 vibrational kinetics[1] ANTONIN BERTHELOT, ANNEMIE BOGAERTS, University of Antwerp, Plasmant, UNIVERSITY OF ANTWERP, PLASMANT TEAM — The conversion of greenhouse gases, especially CO_2, into value-added chemicals is gaining a very large interest among the scientific and industrial communities. It is known that the excitation of the asymmetric vibrational mode of CO_2 is one of the most important processes to achieve high energy efficiencies, thus making the CO_2 kinetics very complex. Due to this complexity, the only models that have been developed so far were zero-dimensional models, considering only the variations over time. These models require strong approximations on the geometry of the reactor. In order to reduce the calculation time and to allow the modeling of complex plasma problems in 2D or 3D geometries, we have simplified the chemistry set of CO_2 and developed a lumped-levels model for the vibrational kinetics. It was found that a 3-groups model gives a good agreement with the state-to-state model at pressures of 100mbar and above, at the conditions under study. The important dissociation and recombination mechanisms of CO_2 have also been investigated. This lumped-levels model is being implemented in a 2D self-consistent microwave plasma code.

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Antonin Berthelot
University of Antwerp, Plasmant

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