Abstract Submitted
for the GEC14 Meeting of
The American Physical Society

Modeling of vibrational kinetics in CO_2 dielectric barrier discharges S. PONDURI, TU Eindhoven, M.M. BECKER, D. LOFFHAGEN, INP Greifswald, S. WELZEL, M.C.M. VAN DE SANDEN, DIFFER, R. ENGELN, TU Eindhoven — CO_2 reduction to CO is considered to improve the prospects of CO_2 recycling which in turn could mitigate the greenhouse effect and serve as energy storage. Non equilibrium plasmas were used in the past to achieve high energy efficiencies in dissociating CO_2. Non equilibrium distribution in asymmetric stretch modes of CO_2, driven by vibrational up-pumping (VV process), has been suggested as key for achieving such high energy efficiencies. In this work, a time-dependent, one dimensional fluid model taking into account balance equations for the densities of all relevant species and electron mean energy is used to investigate the kinetics of VV process in a pure CO_2 dielectric barrier discharge. A Treanor like distribution has been observed in CO_2 asymmetric modes and the rates of dissociation have been obtained from these distributions. The rates thus obtained have proved to be significantly lower than the rates of other dissociating processes such as electron impact dissociation. The effect of power in-coupling, duration of plasma and pressure on the vibrational distributions and CO production rate is also studied.

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Date submitted: 13 Jun 2014 Electronic form version 1.4