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Numerical simulations for plasma-based dry reforming RAMSES SNOECKX, ROBBY AERTS, ANNEMIE BOGAERTS, University of Antwerp — The conversion of greenhouse gases (CO2 and CH4) to more valuable chemicals is one of the challenges of the 21st century. The aim of this study is to describe the plasma chemistry occurring in a DBD for the dry reforming of CO2/CH4 mixtures, via numerical simulations. For this purpose we apply the 0D simulation code "Global_kin," developed by Kushner, in order to simulate the reaction chemistry and the actual reaction conditions for a DBD, including the occurrence of streamers. For the chemistry part, we include a chemistry set consisting of 62 species taking part in 530 reactions. First we describe the reaction chemistry during one streamer, by simulating one discharge pulse and its afterglow, to obtain a better understanding of the reaction kinetics. Subsequently, we expand these results to real time scale simulations, i.e., 1 to 10 seconds, where we analyze the effects of the multiple discharges (streamers) and input energy on the conversion and the selectivity of the reaction products, as well as on the energy efficiency of the process. The model is validated based on experimental data from literature.

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