Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

A spectroscopic study of ethylene destruction and by-product generation using a three-stage atmospheric packed-bed plasma reactor MARKO HUEBNER[1], OLIVIER GUAITELLA[2], ANTOINE ROUSSEAU[3], JUERGEN ROEPCKE[4], None — Using a three-stage dielectric packed-bed plasma reactor at p = 1 bar the destruction of C_2H_4 and the generation of major by-products have been studied by FTIR spectroscopy. As test gas mixture air containing 0.12% humidity with 0.1% ethylene admixture was used. In addition to the fragmentation of the precursor gas, the evolution of the concentration of ten stable reaction products, CO, CO_2 O_3, NO_2, N_2O, HCN, H_2O, HNO_3, CH_2O and CH_2O_2 has been monitored. Applying three sequentially working discharge cells (f = 4 kHz, U = 9 - 12 kV) a nearly complete decomposition of C_2H_4 could be achieved. In maximum the specific energy deposition was about 900 Jl^{-1}. The value of the specific energy β, characterizing the energy efficiency of the ethylene destruction in the used reactor, was 330 Jl^{-1}. The carbon balance of the plasma chemical conversion of ethylene has been analyzed. As a main result of the study, the application of three reactor stages suppresses essentially the production of harmful by-products as formaldehyde, formic acid and NO_2 compared to the use of only one or two stages.

[1]INP-Greifswald, Greifswald, Germany
[2]LPP, Ecole Polytechnique, Palaiseau, France
[3]LPP, Ecole Polytechnique, Palaiseau, France
[4]INP-Greifswald, Greifswald, Germany

Juergen Roepcke
None

Date submitted: 10 Jun 2013 Electronic form version 1.4