Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

Numerical modeling of CF4 decomposition in low pressure inductively coupled plasma: influence of the O2 concentration MAHSA SETAREH, University of Tehran University of Antwerp, MORTEZA FARNIA, ALI MAGHARI, University of Tehran, ANNEMIE BOGAERTS, University of Antwerp — Perfluorinated compounds (PFCs), which are stable and difficult to decompose, are widely utilized in microelectronic manufacturing. The global warming potential of PFCs is so high in comparison with CO_2 that finding a solution for abating PFC emission is crucial. For this purpose, we performed a numerical simulation of the CF_4 decomposition in an inductively coupled plasma reactor with radio frequency power supply, which is used in semiconductor chamber cleaning process. A zero dimensional modeling code Global_kin developed by Kushner is applied to model the reaction set of CF_4/O_2 in typical plasma reactor conditions, such as 2kW power with frequency of 4 MHz, a pressure of 600 mTorr, and a typical residence time of 0.25 s. The model predicts that the reaction products of the CF_4 decomposition are mostly COF_2, CO_2 and CO. COF_2 is a toxic compound, but it can be hydrolyzed easily into HF and CO_2 using the scrubber in the reactor. By carefully altering the ratio between CF_4/O_2, the optimum ratio of the CF_4/O_2 gas mixture can be achieved, leading to more than 80% of CF_4 decomposition. The numerical modeling results for CF_4 decomposition are validated based on experimental data from literature.

Mahsa Setareh
University of Tehran University of Antwerp

Date submitted: 14 Jun 2013 Electronic form version 1.4