Study of the Chemical Mechanism produced by Chlorine and Oxygen Molecules in a Methane Glow Discharge

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First we determine by thermodynamic calculation the complex chemical equilibrium at high temperature in a C-H-O and C-H-Cl system in order to identify the ratio of the species which can be present in function with the temperature and the gas chemical composition.

Secondly, we study the working parameters of the glow discharge reactor, particularly the induced energy and the effects of Cl/C and C/O rates about the CH_4-C_2H_2 conversion. Our experimental work shows the catalytic effects of these molecules (O_2/Cl_2) when the are introduced at low rate into the gas reactant and we can measure the decrease of energy dispensed for the CH_4-C_2H_2 conversion.

In conclusion the bibliography results allow to compare the excitation cross section of the most important species (Cl_2, O_2, CH_4, H_2) in function with the electron energy in a glow discharge. In our experimental conditions we have shown that Cl_2 and O_2 molecules are excited by low energy electrons (2 - 3 eV), consequently a low ratio of chlorine or oxygen catalyses the transformation of methane to acetylene.

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