Decomposition of hazardous gases by pulsed corona discharge

PhD thesises

Miklos Horvath

1st Thesis

Through the research I demonstrated and proved by experiments that the decomposition ratio of the contaminant gases is depended on a certain parameter, which hasn't been examined up to now: the decomposition ratio of the nitrogen-oxide, the sulfur dioxide and the compounds of the benzene series - beside other parameters – is strongly depended on the rise time of the voltage pulses. According to the experimental results, the pulses with shorter rise time, destruct the gases with bigger ratio. In case of nitrogen oxide and sulfur dioxide, the G-value, which marks the energy efficiency of the decomposition, is also depended both the rise and the polarity of the voltage pulses. The calculated and measured G-value approximately 2-3 times bigger for positive pulses than for negative, and it increases with decreasing pulse rise time.

2nd Thesis

I have elaborated a new phenomonologic model for the time and space varying electric field formed in the cylindrical reactor, which is simplier than the others. As a result of the model, the calculated field distribution time and space dependent, its space dependence - revealing the cylindrical reaction cell - decreases with the *r* coordinates: $E \sim 1/r$, its time dependence is pulse shaped, corresponding to the corona pulses. This model describes the electric field with proper accuracy for the further calculations.

3rd Thesis

I have developed a new model for the determination of the reaction rates of the electron-molecule collision - generated chemical reactions taking place in the reactor. This model -contrary to the other models -, considering the time and space dependence of the electric field gives a method for the calculation of the reaction rates. In this way, the rates and through it, the dependence of the decomposition ratio on the pulse characteristic gains theoretical explanation.