ON ELEMENTARY PROCESSES AND CHEMICAL REACTIONS IN LOW TEMPERATURE PLASMA

10th

Symposium

s y m p o s i u m

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REMOVAL OF NOx IN CORONA DISCHARGE AT THE ATMOSPHERIC PRESSURE WITH INNER ELECTRODE MATERIAL VARIATION

K.Hensel, M.Morvová (Bratislava)

The spatial chemical processes and effectiveness of NOx removal at relatively high pressures under the influence of corona discharge was investigated. Also the influence of inner electrode (wire) materials on discharge behaviour and the surface products analyses of the outer electrode are reported. Experiments were carried out using corona discharge of both polarities and products were analysed by infrared (IR) absorption spectrometry. A special attention was paid to calibration measurements of NO and NO_2 at various pressures.

Experimental set-up consist of wire winded on the glass tube placed over the plate electrode and situated in the IR absorption gas cell. Different material of inner electrode (wire) was treated in experiments.

The results obtained showed that :

- negative corona discharge is more stable, but its deNOx effect is mostly very unpredictable (deNO is usually very effective but NO_2 more or less increase when also NO is present)
- in positive polarity deNO efficiency is about the same, but in all cases also NO_2 decrease.
- both deNO and $deNO_2$ processes at lower partial pressure is more effective in positive corona (50 Torr). At higher pressures (more than 200 Torr) is effect of both polarities about the same.
- experiments showed that mostly $deNO_2$ processes is material depending.
- changes in N_2O concentrations seems to be very important.

CORONA DISCHARGE DEVICE FOR deNOx PROCESSES.

R.Gašparík, M.Morvová (Bratislava)

Device for decomposition of NOx and other components of combustion exhausts on the base of the corona discharge and coaxial geometry was designed for 10 Nm^3/h flow volume of flue gases and was realized completely, with gas flow dynamic system and system to water or water solution spraying by the use of ultrasound. This equipment contains 24 discharge tubes in two sectors. Various materials of electrodes was tested in tree completely realized systems.

Following materials was used: cooper, stainless steel and brass for high voltage electrodes and brass and aluminium for law voltage electrodes.

These options were realized because of assumed catalytic effects of electrode material. The experimental evidence for this was gained during measurements performed.

Measurements was contractly effected in glass-work plant named ORNELA in Czech Republic.

Energy dependences of reactions of Si^+ with H_2O and H_2S

J. Glosík [1,2], P. Zakouřil[1,2] and W. Lindinger[1] ([1]Innsbruck, [2]Prague)

The rate coefficients for the reactions of Si^+ with H_2O and H_2S have been measured as a function of reactant ion / reactant neutral average center-of-mass kinetic energy (E_r). The measurements were performed using a selected ion flow drift tube operated at 300K with helium buffer gas. Both reactions have rate coefficients close to their collisional values at ambient temperature and exhibit a pronounced E_r dependence. The rate coefficients of reaction of Si^+ with H_2O producing $SiOH^+$ decrease by one order of magnitude with E_r increasing from 0.05 eV to 0.4 eV. The rate coefficient of the reaction of Si^+ with H_2S, producing $SiSH^+$ and SiH^+, is decreasing with E_r increasing from 0.05 to 2.5 eV. When considering the branching ratio, the reaction rate coefficient for channel producing $SiSH^+$ is decreasing by nearly two orders of magnitude. The reaction rate coefficient for channel producing SiH^+ is increasing with increasing E_r and at energies higher as 1 eV this channel is dominated.