Ozone recovery in the presence of nitrous oxides

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The temporal profiles of ozone number densities after pulsed UV laser photolysis in a gas mixture O_2-O_3-N_2-N_2O obtained by time-resolved absorption spectroscopy was presented. The experimental results demonstrated the dominance of the stabilization channel over the reactive one for the reaction of O_3 (υ) with N_2O and NO. The rate constants for the processes $O_3(\upsilon) + N_2O \rightarrow O_3 + N_2O$ and $O_3(\upsilon) + NO \rightarrow O_2 + NO_2$ was obtained to be $(1.5\pm0.2) \times 10^{-13}$ cm^3/s and $(2.0\pm0.2) \times 10^{-11}$ cm^3/s, respectively, using kinetics modeling of experimental data.

Vibrationally excited ozone can react with compounds of fuel-air mixtures in fire zones of power-producing units, also with nitrious oxides in high temperature zones.

Reaction of vibrationally excited ozone with nitrogen oxide $O_3(\upsilon) + NO \rightarrow NO_2 + O_2$ (1) has more probability then reaction with thermalized ozone $O_3 + NO \rightarrow NO_2 + O_2$ with rate constant 1.8×10^{-14} $см^3/с$ [1-4]. Also, kinetic data for relaxation process $O_3(\upsilon) + N_2O \rightarrow O_3 + N_2O$ (2) are missed in literature. In this work rate constants for processes (1-2) was found by temporal profiles of ozone number densities in different conditions of gas mixture O_2-O_3-N_2-N_2O after UV laser photolysis [5]. The rate constants for the processes (1) and (2) was obtained to be $(2.0\pm0.2) \times 10^{-11}$ cm^3/s and $(1.5\pm0.2) \times 10^{-13}$ cm^3/s, respectively.

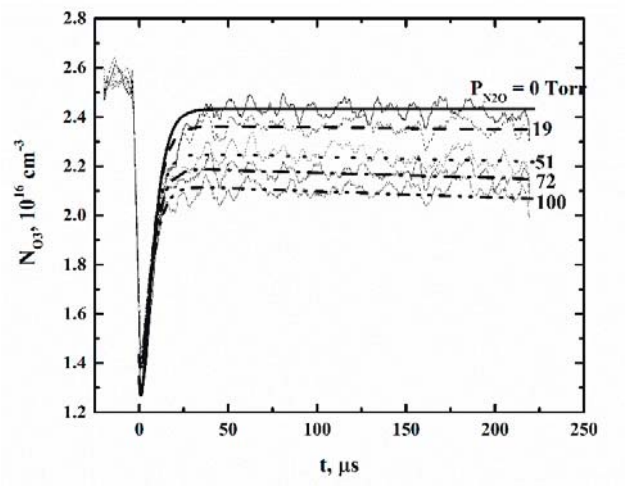

Figure 1 – Temporal profiles for concentration of O_3 for E=70 mJ/cm^2, P_{tot}=807 Torr, P_{O2} =600 Torr, T=300 K and different pressures of N_2O.

References

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