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The Kinetics of the Reaction between Fluorine and Ethylene in a Diffusion Flame

G. A. KAPRALOVA, A. M. CHAIKIN, AND A. E. SHILOV

Institute of Chemical Physics, Academy of Sciences, USSR

This reaction was studied between 25° and 157°C. The ethylene concentration in the flame exceeded that of fluorine by a factor of 1000. The analysis of the products and kinetic measurements have shown that the following reactions take place:

$$F_2 + C_2H_4 \rightarrow F + C_2H_4F$$

$$F + C_2H_4 \rightarrow C_2H_4F$$

$$2C_2H_4F \begin{array}{l} \nearrow C_4H_8F_2 \\ \searrow C_2H_3F + C_2H_5F \end{array} \qquad (1)$$

The rate constant for reaction (1) is $8 \times 10^{-14} e^{-4600/RT}$ cm³/sec.

Preflame Processes and Ignition of Various Hydrocarbons. II. The Intensity of the Cool-Flame Stage

A. N. VOINOV AND D. I. SKORODELOV

Institute of Chemical Physics, Academy of Sciences, USSR; and Moscow Institute of Highway Engineering

Data are presented on the intensity of cool flames as a function of temperature and compression of the fuel mixture. The intensity was measured in terms of the luminance of the glow ($I_{\text{cool flame}}$) and of the relative increment of pressure $\Delta P_{\text{cool flame}}/P_{\text{comp}}$. The authors tested stoichiometric mixtures of fuel and air by using the following hydrocarbons: *n*-hexane, isooctane, cyclohexane, cyclohexene, diisobutylene, and a 60:40 mixture of isooctane and *n*-heptane. The authors have shown that, for saturated hydrocarbons, the temperature functions of $\Delta P_{\text{cool flame}}/P_{\text{comp}}$ and of log $I_{\text{cool flame}}$ form a family of similar curves; furthermore, within the range of $T_{\text{comp}} =$ 400°–450°C, these quantities are related to the octane numbers of the fuels. The situation is very different with olefinic hydrocarbons: the cool flame appears while the mixture is still being compressed, and has a glow of very low intensity. This apparently is why unsaturated hydrocarbons do not exhibit a region of two-stage, low-temperature ignition. This also explains the high-temperature sensitivity and poor response to anti-knock substances exhibited by these hydrocarbons.

Two-Stage Burning of Explosive Mixtures. IV. The Rate of Pressure Increase during the Cool-Flame Stage of Combustion of Isooctane–*n*-Heptane Mixtures in Air

S. A. YANTOVSKII

The State Research and Design Institute for the Nitrogen and Organic Synthesis Industries

The author relates the length of the induction period and of the period of pressure increase in the two-stage ignition of isooctane–*n*-heptane mixtures in air to the initial temperature and pressure of this process. He then uses these relations to calculate the following factors: the apparent activation energy, the apparent reaction order, and the rate of pressure increase during the cool-flame stage. The magnitudes of these factors differ in the various regions of the low-temperature ignition region.

The rate of pressure rise (measured in a bomb) during the first ignition stage decreases with the increase in the octane number of the mixture. The behavior of the intensity of the cool flames of these mixtures in internal combustion engines parallels the behavior of the pressure.

The Mechanism of Reactions of Epoxides with Carboxylic Acids

M. F. SOROKIN AND E. L. GERSHANOVA

The Mendeleyev Chemical Engineering Institute, Moscow

The authors have studied the base-catalyzed reactions of monoepoxides with carboxylic acids.