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INVESTIGATION OF THERMAL DECOMPOSITION OF $(NO_2)_2NiF_6$

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The thermal decomposition of $(NO_2)_2\ NiF_6$ in a closed system has been investigated in the temperature range from 393 to 443K. The decomposition rate has been investigated by measuring the increase of the total pressure of the gaseous decomposition products of F_2 and NO_2F in the IR spectrophotometric cell. The concentration variation of NO_2F has been registered using spectrophotometric technique on the band 572 cm^{-1} ($\nu_3 A_1$). The analyses of the experimental results proved that the decomposition of $(NO_2)_2NiF_6$ might be described in terms of the total reaction $(NO_2)_2NiF_6 \longrightarrow NO_2F + NiF_2$. NO_2F, involving the following stages:

$$(NO_2)_2\ NiF_6 \xrightarrow{K_1} 2NO_2F + NiF_4 \quad (1); \quad NiF_4 \xrightarrow{K_2} NiF_2 + F_2 \quad (2);$$

$$NO_2\ F + NiF_2 \xrightarrow{K_3} NO_2F \cdot NiF_2 \quad (3).$$

The mathematical simulation of the process has been carried out with the aid of a computer. Being calculated in terms of Arrhenius dependence $\ln k = f(1/T)$ the effective activation energies of the stages mentioned above proved to be equal to $E_1=(38 \pm 7)$ KJ/mol, $E_2= (46 \pm 8)$ KJ/mol and $E_3= (4 \pm 1)$ KJ/mol.

The decomposition reaction of $(NO_2)_2\ NiF_6$ into fluorine nitrile and nickel tetrafluoride (1) is the limiting stage of the thermal decomposition process.