DEPENDENCE OF THE MAXIMUM RATE OF NITRIC OXIDE OXIDTION ON THE CONCENTRATION OF REACTANTS

Prishchenko O. P.
National Technical University
«Kharkiv Polytechnic Institute», Kharkiv

Let us establish at what percentage of oxygen in the gas mixture the rate of oxidation of nitric oxide will be maximum.

In equation it comfortably the concentration of NO and O_2 to express in by volume percent's. Then $x + y = 100$ and kinetic equation will assume an air

$$v = k(100x^2 - x^3).$$

Thus, a problem stands in that, to find a maximum of function.

For her decision we will take advantage of the second rule of research of stationary points, that is we will find

$$v' = k\left(200x - 3x^2\right) \text{ and } v'' = k\left(200 - 6x\right);$$

we will work out an equation $200x - 3x^2 = 0,$ deciding that, we will get stationary points $x_1 = 0$, $x_2 = 200/3.$

We will now find the value of the second derivative at fixed points:

$$v''(0) = 200k > 0;$$

$$v''(200/3) = k(200 - 400) < 0,$$

since $k > 0$.

So, $x_2 = 200/3$ is the maximum point of the function and therefore $y_2 = 100 - 200/3 = 33{,}3$ is the maximum concentration O_2 (fig. 1).

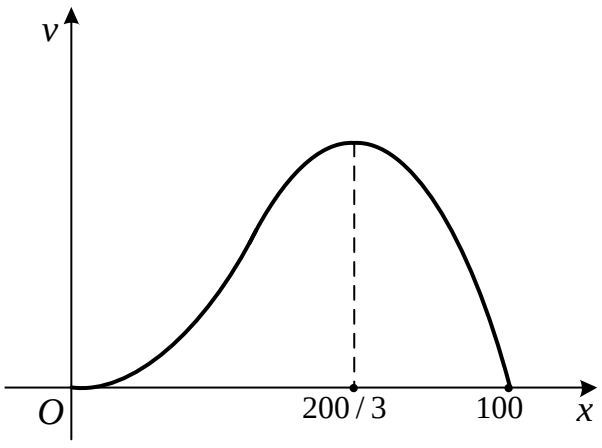

Fig. 1

Conclusion. Speed of oxidization will appear maximal, if in mixture it will be contained 33,3% oxygen. So in the process of reaction stoichiometrical correlation $y : x$ is saved, then at maintenance in initial mixture of 33,3% oxygen speed of reaction will be maximally possible during all process. However, this result is faithful only in one case, when the examined reaction will be irreversible, that maybe in the certain range of temperatures.