ACTIVATION OF REAGENTS MOLECULES TO IMPROVE THE EFFICIENCY OF REDOX REACTIONS

L. Chervinsky, B. Kovalyshyn

The oxidation-reduction reactions are the main chemical interactions in the energy and mass transfer processes of formation and transformation of organic matter in inanimate nature and the functioning of living organisms. Optimization of the redox chemical reactions enhances the efficiency of light irradiation plants during photosynthesis and energy burning fuel in heat generating plants.

The purpose of research is theoretical and experimental study efficiency flow redox chemical reactions by activating reagent molecules from different sources.

An important issue of modern chemical kinetics is the study of the chemical properties of the reaction depends on the internal energy of the system, structure and atomic and molecular structure of reagents. The basic law of chemical kinetics, describing the chemical reactions Arrhenius law is.

Proposed a working hypothesis that activation of molecules reagents other than heat, energy can also be used by other external factors, which reduces the molecules used to activate heat.

By activating molecules known methods, except termoactivation include activation of fast electrons, activation of radioactive particles in a magnetic field activation, ultrasound activation, photoactivation, activation of an electric field and other methods. According to the foundations of quantum physics total energy of the molecule consists of electronic, vibrational and rotational energy. State of the atom or molecule divided depending on the energy level of stable, unstable and metastable. Some sources are unstable (resonance) energy levels are called singlet and metastable - triplet. The effectiveness of chemical reactions depends on the duration of molecules in the excited state (dissipation time). At the resonant excitation of molecules of singlet levels are to 10^{-8}-10^{-10}s. The residence time of atoms and molecules in metastable triplet excitation levels of at least several orders of magnitude larger (~ $10^{-4} \div 10^{-2}$ s and more).

Conducted characterization techniques such as photo- and electroactivation. Experimental study of the effectiveness electroactivation molecules reagents combustion reaction was to evaluate the efficiency of burning propane-butane mixture and natural gas in the air under conditions of activation. The control option in all experiments were variants of the combustion of hydrocarbons in the air without elektroaktyvatsiyi. The efficiency of burning hydrocarbons estimated time of heating water from 20 °C to 40 °C. Electric field pulses varied in the frequency

range 0 ÷ 140 Hz. The efficiency of the combustion elektroaktyvatsiyi components in the application VPNEP estimated time for the excess heat water without activating components of the combustion over time when they are activated. Repeated Triple experiment.

The results of the study, the following conclusions:

- The possibility to increase the efficiency of redox reactions with additional molecules activating reagents from different energy factors;

- Transfer of molecules of methane, propane, oxygen and nitrogen in the singlet energy levels held by ultraviolet radiation with a wavelength of 96 - 134 nm, and the same molecules in triplet level - ultraviolet radiation with a wavelength of 138 - 278 nm;

- Electroactivaion of propane and air leads to a decrease in the time of heating water by 19.0 ... 22.1% at a frequency of 100 ... 120 Hz;

- Electroactivaion of natural gas and air leads to a decrease heating time by 12.0% at a frequency of 100 Hz. Elektroaktyvatsiya only air reduces heating time by 11.1%, while that NIR0,05 = 2.46 indicates nesuttyevist differences between versions. - The difference in efficiency elektroaktyvatsiyi propane-butane mixture and natural gas due to differences in the structure of molecules of propane, butane and methane.