

Kinetics of coherently synchronized peroxidase reaction of ethyl alcohol by green oxidizing agent - hydrogen peroxide



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Abstract

Kinetics in the model system of reaction of ethyl alcohol conversion to acetaldehyde peroxidase by hydrogen peroxide in the presence of an iron porphyrin-containing biomimetic catalyst were studied. Application of such oxidation system, as shown by experimental results, meets the basic requirements of the Green Chemistry concept. The process was carried out in the gas phase at the temperature of 180°C and atmospheric pressure on per-FTPhPFe₃+OH/Al₂O₃ heterogeneous biomimetic catalyst using 20% hydrogen peroxide. As a result of the process acetaldehyde was obtained with the yield of 93.5% and selectivity of 98% (taking into account the loss). Through the experimental study of kinetic laws of ethyl alcohol peroxidase reaction, coherently synchronized nature of the mechanism of ethyl alcohol conversion to acetaldehyde by hydrogen peroxide on the surface of the biomimetic was identified. Thereby there was a need for a special approach to the kinetic modeling of this reaction. The mechanism presented demonstrates that the following two interconnected and interacting reactions proceed in this system: the reaction of H₂O₂ decomposition of and the reaction of peroxidase oxidation of ethyl alcohol.

Speaker Publications:

1. "Catalytic monooxidation of cyclohexane by hydrogen peroxide in the gas phase"; Journal of Reaction Kinetics, Mechanisms and Catalysis, VL - 126, 2019.
2. "Coherent-Synchronized Biomimetic Monooxidation of Cyclohexane by Hydrogen Peroxide"; Russian Journal of Physical Chemistry A / VL- 92 /2018.
3. "Carbonaceous nanostructures in hydrocarbons and polymeric aerobic oxidation mediums"; Journal of Fullerenes, Graphenes and Nanotubes , 2018(pp.631-681).

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Biography:

Tofik Nagiev is a Vice-president of Azerbaijan National Academy of Sciences, Director of Research Center of "Azerbaijan National Encyclopedia" and Department chief of Nagiev Institute of Catalysis and inorganic chemistry of ANAS. The Professor of the department of the physical and colloid chemistry of Baku State University. He is author of the monography "Coherent Synchronized Oxidation Reactions by Hydrogen Peroxide", Amsterdam: "Elsevier", p. 325, 2007.