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Coherent-synchronized gas-phase oxidation of piperidine with H_2O_2 and N_2O

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In the present work, we report the results of the experiments coherent-synchronized gas-phase oxidation of piperidine with hydrogen peroxide and nitrous oxide. For instance, implementation of the chemical conjugation mechanism in piperidine oxidation helps in pyridine and 2, 3, 4, 5-tetrahydropyridine. The experiments were performed to determine the kinetics of the homogeneous oxidation of piperidine involving hydrogen peroxide and nitrous oxide. The experimental setup and procedure used in the study of conjugated oxidation with hydrogen peroxide are detailed elsewhere. The reactions were conducted at atmospheric pressure in a flow quartz reactor of the integral type, whose design allowed undecomposed H_2O_2 to be fed into the reaction zone separately from the hydrocarbon. The reaction of piperidine conjugated dehydrogenation of natural compounds, which include piperidine fragments. As shown by experimental data, pyridine yield increases from 45% to 65.2% with hydrogen peroxide concentration from 20% to 25%, respectively, with reaction selectivity above 98%. As is seen from Fig.1, an increase of the temperature from 500 to 540°C is accompanied by an increase of the yield of pyridine, what is associated with the growth of generation rate of the active centers – HO_2-radicals under thermal decomposition of hydrogen peroxide. Some decrease of oxygen amount in gaseous phase indicates to it as well. To study gas-phase oxidation of piperidine with N_2O was important. Investigated temperature effect to yield of products of reaction to find out the reactivity of nitrous oxide. Reaction of oxidation of piperidine with nitrous oxide shows that main product is 2, 3, 4, 5-tetrahydropyridine in 300-450. Yield is 8.3% besides in small quantities 1-nitrosopiperidine form in less temperature than 200°C. In this direction research is continuing where studying kinetics of reaction.

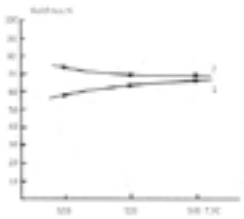

Fig.1 Temperature dependences of the (1) pyridine yield and (2) oxygen concentration.
The concentration of H_2O_2 is 25wt%, the piperidine ratio is 1.56 h-1 and piperidine/H_2O_2 =1:3

Recent publications

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2. Ali-zadeh N I, Nagieva I T, Babaeva B T, Magerramov A M and Nagiev T M (2011) Oxidation of pyridine bases by hydrogen peroxide. Journal of Chemistry and Chemical Engineering 5(1):82-88.
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Biography

T M 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. He is also the Professor of the Department of the Physical and Colloid Chemistry of Baku State University.

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