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Nitrogen fixation at conjugated oxidation by hydrogen peroxide

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The problem of nitrogen fixation is one of the most important scientific and technical tasks. Nitrogen and nitrogen compound making industry is one of the leading branches of the modern chemical industry. The state of the art of it is the main factor affecting supply of nitrogenous fertilizers to agriculture and of various nitrogen-containing substances to industry. Fig 1 shows dependence of molecular nitrogen conversion on its volume rate in the temperature range of 773-873 K. It is clearly observed that the quantity of fixed nitrogen per injected molecular nitrogen increases to some extent with the amount of injected molecular nitrogen. A further increase of raw material rate does not change the level of nitrogen fixation. Despite shorter contact time, the increase of N_2 volume rate from 1 to 4 l/h intensifies the reaction. The aqueous hydroperoxide rate is constant for all nitrogen rates. However, at nitrogen rate of 4-5 l/h the fixed nitrogen yield is altered. Thus, chemical induction is the main factor promoting N_2 fixation in N_2-H_2O_2-H_2O system. It manifests itself owing to coupling of H_2O_2 dissociation reactions, which generate the intermediate- radical-to the system. This intermediate transfers the induction action of the primary reaction to N_2 oxidation process. In this case, H_2O_2 is injected in amounts much greater than demanded by N_2 oxidation, because the main requirement for effective chemical coupling is the presence of in high concentration. To conclude the discussion, it should be noted that oxidative fixation of molecular nitrogen with hydrogen peroxide is rather simple for process engineering design, usually proceeds under homogeneous conditions without any catalyst under atmospheric pressure, and produces high yield of fixed nitrogen.

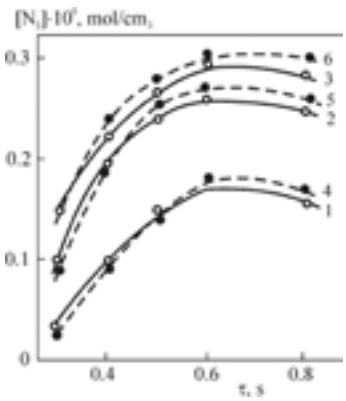

Figure 1: *Kinetics of nitrogen fixation with hydrogen peroxide: molar ratio N_2:30% H_2O_2 = 1:1.6; 1 – 3 – T = 773, 823 and 873 K, respectively; 4 – 6 – theoretical curves at these temperatures*

Biography

Tofik 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 the Professor of the department of the Physical and Colloid Chemistry of Baku State University..