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Reaction kinetics in chemical engineering

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Abstract

In the lecture is presented a theoretical analysis of the role of the reaction kinetics in chemical engineering for the solution of the main problems in the chemical industry (biotechnology, heat energy), i.e. the optimal design of new devices and the optimal control of active processes. The thermodynamic and hydrodynamic approximations for the modelling of the industrial process rates are presented and analysed. The industrial processes are the result of reactions, i.e. creation or disappearance of a substance and (or) heat as a result of chemical and (or) physical processes and their rate is determined by the reaction kinetics.

The reactions deviate the systems from the thermodynamic equilibrium and as a result processes arise, who are trying to restore that equilibrium. The rate of these processes can be determined by Onsager's "linearity principle", where the rate of the process depends linearly on the deviation from the thermodynamic equilibrium. The Onsager's linearity coefficient can be determined after solving the hydrodynamics, mass transfer and heat transfer equations, where it is proportional to the mass transfer (heat transfer) coefficient. The relations between the Onsager's linearity coefficient and mass transfer coefficient are presented for different processes.

Biography

Education and degrees: 1. Education (1954 – 1960) - Higher Institute of Chemical Technology (Sofia, Bulgaria); 2. PhD (1968) – USSR, Moscow Institute of Chemical Mechanical Engineering; 3. Doctor of Technical Sciences (1978), Higher Institute of Chemical Technology (Sofia, Bulgaria).

Specializations: 1963, USSR, Moscow, Supervisor-Prof. V.G. Levich, 4 months; 1968, USSR, Novosibirsk, Supervisor-Prof. M.G. Slinko, 4 months.

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