

THE STOICHIOMETRIC UNIQUENESS OF MULTIPLE CHEMICAL REACTION SYSTEMS IN CHEMICAL THERMODYNAMICS, KINETICS AND CATALYSIS – CONTRIBUTIONS OF PROFESSOR ILIE FISHTIK

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Abstract. The main scientific achievements of great significance accomplished by Professor Ilie Fishtik at the University of Iowa and the Worcester Polytechnic Institute, in several fields of the physical chemistry as chemical thermodynamics, kinetics and heterogeneous catalysis were revealed and briefly analyzed. Fundamental equations of chemical thermodynamics within the De Donder (stoichiometric) approach were reformulated in terms of a special class of chemical reactions, called as response reactions. Using this approach, the unusual behavior of chemical equilibrium systems, to interpret the apparent contradictions to Le Chatelier principle and to discover hitherto unnoticed thermodynamic identities, was rationalized. The stabilities of chemical species were formulated in terms of a certain class of stoichiometrically unique chemical reactions and their thermochemical characteristics. A completely new approach for the generation and simplification of kinetic mechanisms for complex reaction systems was developed and applied. Based on a new type of reaction networks, referred to as reaction route graphs, a systematic method of analysis and reduction of a microkinetic mechanism was established and employed.

Keywords: response reaction, chemical thermodynamics, kinetics, heterogeneous catalysis, stoichiometry.

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