

Teaching and Learning Dialectical Relationship between Thermodynamic Equilibrium and Reaction Rate Constant

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Abstract : The development of science and technology in the present era has an urgent demand for the training of thinking of undergraduates. This requirement actively promotes research and teaching of basic theories, beneficial to the career development of students. This study clarified the dialectical relation between the thermodynamic equilibrium constant and reaction rate constant through the contrast thinking method. Findings reveal that both the isobaric Van't Hoff equation and the Arrhenius equation had four similar forms, and the change in the trend of both constants showed a similar law. By the derivation of the formation rate constant of the product (K_Y) and the consumption rate constant of the reactant (K_A), the ratio of both constants at the end state indicated the nature of the equilibrium state in agreement with that of the thermodynamic equilibrium constant ($K^\theta(T)$). This study has thus presented that the thermodynamic equilibrium constant contained the characteristics of microscopic dynamics based on the analysis of the reaction mechanism, and both constants are organically connected and unified. The reaction enthalpy and activation energy are closely related to each other with the same connotation.

Keywords : thermodynamic equilibrium constant, reaction rate constant, PBL teaching, dialectical relation, innovative thinking

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