HANDBOOK OF CHEMICAL EQUILIBRIA IN ANALYTICAL CHEMISTRY

Stanislav Kotrlý
and
Ladislav Šůcha

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CHAPTER 1

Chemical reactions and equilibria in analytical chemistry

Development of instrumentation, which has so profoundly changed science and technology over the past 30 years, has resulted in the introduction of numerous new instrumental methods and techniques for chemical analysis. Some of these methods of analytical determination are based on interaction between energy and the matter of the component to be determined in the sample; the need for a chemical reaction with an analytical reagent is thus eliminated from the finish of the analysis. Automated spectrometry (quantometry), which is widely used in metallurgy, is a typical example of such an instrumental method. However, most analytical methods and procedures currently used are still based on chemical reactions.

Reaction chemistry is important, especially for the following stages of chemical analysis. (1) Treatment of the sample in order to obtain a form suitable for further analysis; for many sample materials, dissolution in acids or fusion is necessary in order to convert the components into compounds soluble in water or another solvent. (2) Separation of individual components of the sample material. (3) The determination itself.

As can be seen, chemical reactions will remain indispensable for chemical analysis for the foreseeable future, and new inspiring applications that help to achieve higher selectivity or lower the limit of determination, often in combination with instrumental techniques, will be found.

Analytical chemistry is thus concerned with many aspects of the kinetics and thermodynamics of chemical reactions. From the view-point of chemical kinetics all chemical reactions applicable in analytical chemistry should proceed rapidly (best within the mixing time of reactants) and without formation of side-products, which implies a one-way reaction mechanism. Kinetic methods of chemical analysis represent an exception in this respect: determination of the concentration of a component is in this case based on a measurement influenced by the rate of the reaction.