



Chemical Energy and Exergy: An Introduction to Chemical Thermodynamics for Engineers

Norio Sato

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This book is a beginners introduction to chemical thermodynamics for engineers.

In the textbook efforts have been made to visualize as clearly as possible the main concepts of thermodynamic quantities such as enthalpy and entropy, thus making them more perceivable. Furthermore, intricate formulae in thermodynamics have been discussed as functionally unified sets of formulae to understand their meaning rather than to mathematically derive them in detail.

In this textbook, the affinity of irreversible processes, defined by the second law of thermodynamics, has been treated as the main subject, rather than the equilibrium of chemical reactions. The concept of affinity is applicable in general not only to the processes of chemical reactions but also to all kinds of irreversible processes.

This textbook also includes electrochemical thermodynamics in which, instead of the classical phenomenological approach, molecular science provides an advanced understanding of the reactions of charged particles such as ions and electrons at the electrodes.

Recently, engineering thermodynamics has introduced a new thermodynamic potential called exergy, which essentially is related to the concept of the affinity of irreversible processes. This textbook discusses the relation between exergy and affinity and explains the exergy balance diagram and exergy vector diagram applicable to exergy analyses in chemical manufacturing processes.

This textbook is written in the hope that the readers understand in a broad way the fundamental concepts of energy and exergy from chemical thermodynamics in practical applications. Finishing this book, the readers may easily step forward further into an advanced text of their specified line.

- Visualizes the main concepts of thermodynamics to show the meaning of the quantities and formulae.
- Focuses mainly on the affinity of irreversible processes and the related concept of exergy.
- Provides an advanced understanding of electrochemical thermodynamics.

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