Book Reviews

Chemical Thermodynamics for Industry. Edited by T. M. Letcher. The Royal Society of Chemistry: Letchworth, U.K., 2004. ISBN 0-85404-591-0.

This interesting book edited by T. M. Letcher presents a concise summary of different technologies related to chemical and chemical engineering thermodynamics. Some of the chapters are on standard topics such as calorimetry and reactive distillation, while some chapters touch upon more unconventional content such as thermodynamics of nanoparticles and new materials. Given the wide variety of subjects, the content in each chapter is by necessity terse, and chapters should be seen as brief reviews of the state of the art. Most of the chapters supply generous bibliographical references and are good starting points for further studies. For easier reference, the chapters are grouped according to major subject areas using the chapter number and title.

New Frontiers

The results shown by Sandler (5) based on first-principles quantum mechanics as well as COSMO techniques are interesting and hold promise to provide chemical engineers with better, more fundamental estimation techniques for physical properties necessary for process simulation. Gmehling's (7) introduction on ionic liquids is instructive, and it will be interesting to see if such liquids will change the status quo of polar solvents commonly used in extraction and distillation. Reverchon and de Marco (12) show different morphologies that can be obtained using solvent/anti-solvent techniques at supercritical conditions. Schoroeder and Martin (17) present results related to the use of membranes for O_2 enrichment and hydrocarbon oxidation as well as solid oxide fuel cells. Spencer (17) shows some interesting results related to inorganic physical vapor deposition and enthalpy of formation data for metal carbides and nitrites. Tanaka, Lee, and Hirai (18) show the use of small particle thermodynamics for the calculation of nano-sized phase diagrams.

5 Thermodynamic Properties from Quantum Chemistry
7 Ionic Liquids in Separation Processes
12 Micro and Nano-particles Production Using Supercritical Fluids
16 Thermodynamics of New Materials
17 Thermodynamic Prediction of the Formation and Composition Ranges of Metastable Coating Structures in PVD Processes
18 Thermodynamics of Nano-Sized Particles

Thermodynamics and Process Engineering

Kjelstrup, Rosjorde, and Johannessen (1) show applications of non-equilibrium thermodynamics to paths of operation, distillation, and chemical reactors. Koukkari, Pajarre, and Rasanen (3) illustrate the use of thermodynamics to aqueous systems with fibers and electrolytes. Schoenmakers and Arlt (4) provide an introduction to reactive distillation and basic criteria for equipment selection for homogeneous catalysis. Sloan (6) presents a concise introduction to hydrates, their modeling using statistical mechanics and the importance of kinetic processes. Wakeham and Assael (11) provide a review on the theory and methods related to viscosity, thermal conductivity and diffusivity. Chen, Watanasiri, Mathias, and de Leeuw provide an overview on how applied thermodynamics is used within a commercial process simulation environment. Thomsen (19) introduction to electrolytes is useful and briefly shows how density and viscosity may be modeled. Teja and Russeau (20) provide a brief introduction to the classic modeling of solid−liquid equilibrium. Myers (21) introduction to adsorption is clear and useful, and includes an example using ethane/ethylene over faujasite. Reguera and Rubi (22) show an interesting link between non-equilibrium thermodynamics and different states in a polymer. Ramjugernath and Sharma (23) provide a brief review of the most important properties related to oil characterization.

1 Non-Equilibrium Thermodynamics for Industry
3 Multiphase Thermodynamics of Pulp Suspensions
4 Reactive Distillation
6 Thermodynamics of Natural Gas Clathrate Hydrates
11 Transport Properties and Industry
15 Industry Perspective on the Economic Value of Applied Thermodynamics and the Unmet Needs of AspenTech Clients
19 Thermodynamics of Electrolyte Systems of Industry
20 Thermodynamics of Crystallization
21 Thermodynamics of Adsorption
22 Mesoscopic Non-Equilibrium Thermodynamics of Polymer Crystallization
23 Applied Thermodynamics for Petroleum Fluids in the Refining Industry

Processes and Calorimetry

Modigell, Traebert, Monheim, and Hack (2) show the basic principles related to the modeling of metallurgical decarburization using gas-metal reactions. Dan and Grolier provide a useful introduction to reaction calorimetry. Beezer (9) shows the use of calorimetry in the pharmaceutical industry and a brief exposition on miniature calorimeters. O'Neill (10) describes the basic principles of isothermal flow calorimetry including a sample experiment. Grolier and Dan present a clear introduction to calorimetry as applied to the measurement of physical properties and are quite useful for chemical engineers. Arlt (14) provides a brief review of issues related to plastics recycling such as cost, schemes, and energy consumption.

2 A Modelling Technique for Non-equilibrium Metallurgical Processes Applied to the LD Converter
8 Spectrocalorimetric Screening for Complex Process Optimization
9 Microcalorimetry for the Pharmaceutical Industry
10 Isothermal Flow-Microcalorimetry: Principles and Applications for Industry
13 Calorimetric Measurements of Thermophysical Properties for Industry
14 Plastic Recycling

Marco A. Satyro

Virtual Materials Group

JE050430A

10.1021/je050430a