



Handbook on Material and Energy Balance Calculations in Material Processing, Includes CD-ROM

By Arthur E. Morris, Gordon Geiger, H. Alan Fine

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Lately, there has been a renewed push to minimize the waste of materials and energy that accompany the production and processing of various materials. This third edition of this reference emphasizes the fundamental principles of the conservation of mass and energy, and their consequences as they relate to materials and energy. New to this edition are numerous worked examples, illustrating conventional and novel problem-solving techniques in applications such as semiconductor processing, environmental engineering, the production and processing of advanced and exotic materials for aerospace, electronic, and structural applications.

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Editorial Review

Review

"Authored by Arthur E. Morris, Gordon Geiger, and H. Alan Fine, this completely revised third edition provides a clear, comprehensive treatment of the use of mass balance and stoichiometry techniques, and the application of the First Law of Thermodynamics, to the production and processing of mineral, metallic, and ceramic materials. The text comes with a CD containing an extensive thermodynamic database, specially-developed software to carry out more complex calculations, and a bonus set of flowsheeting notes by Dr. Eric Grimsey of Curtin University, Australia." (TMS News, 1 August 2011)

From the Back Cover

The only material/heat balance book for materials processing applications

This completely revised Third Edition provides a clear, comprehensive treatment of the use of mass balance and stoichiometry techniques, and the application of the First Law of Thermodynamics, to the production and processing of mineral, metallic, and ceramic materials. The book covers the initial treatment of ores and scrap to the production of advanced materials, with extensive use of spreadsheet techniques for making material and heat balance calculations. The accompanying CD contains detailed notes on the construction and analysis of metallurgical flowsheets by Dr. Eric Grimsey of Curtin University, Australia. Given the current challenge to use materials and energy efficiently, it is an essential resource for everyone interested in materials processing.

Key Features of the Third Edition:

- Treatment of the AES and SI system of units, including conversion software
- Construction of flowsheets, their presentation, and Degree of Freedom analysis
- The statistics of measurement and sampling, regression analysis of data, and experimental design
- Over 150 text and software examples worked out in detail and an in-depth analysis of five case studies
- The use, optimization, and conservation of energy in materials processing
- The equilibrium constant and reaction kinetics as process restrictions
- Spreadsheet templates for combustion, flame temperature, process control, and Wobbe index calculations
- The use of a thermodynamic database in the derivation of sensible heat, enthalpy of formation, and reaction equilibrium expressions
- A CD containing an extensive thermodynamics database, and specially-developed material and heat balance software capable of handling multi-reactor flowsheets with recycle and bypass streams, counter-current flow, heat exchangers, and time-dependent composition changes

About the Author

Arthur E. Morris is Professor Emeritus of Metallurgical Engineering in the Department of Metallurgical Engineering at the Missouri University of Science and Technology—Rolla, where he taught for thirty years. A consultant to several industrial corporations, he was asked by the U.S. Bureau of Mines to organize a new

department-wide research group—the Generic Mineral Technology Center for Pyrometallurgy, where he was principal investigator until his retirement in 1996. He has prepared CDs for other texts and developed short courses on materials processing, as well as publishing nearly seventy papers on various aspects of the subject.

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