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book review

Transport Phenomena in Multiphase Systems, by Amir Faghri and Yuwen Zhang, Academic Press, 1064 pages, 2006, ISBN-13: 978-0-12-370610-2, US $89.95

Reviewed by **Ralph L. Webb**

This is a welcome new text book on multi-phase heat transfer and fluid flow. It is printed on a quality semi-gloss paper and has numerous figures and example problems. It will compete with other textbooks by Carey (1992) and Collier and Thome (1994). The Faghri and Zhang book is not limited to "two-phase flow and heat transfer" as is the Collier and Thome (1994) book. Although the Carey book addresses "interfacial phenomena," the Faghri and Zhang spans a broader range of "multi-phase" systems than that of Carey—particularly chapters 5 (Solid-Liquid-Vapor Phenomena and Interfacial Mass Transfer), Chapter 6 (Melting and Solidification), and Chapter 7 (Sublimation and Vapor Deposition). Separate chapters (Chapter 2, Thermodynamics of Multiphase Systems), and (Chapter 3 Generalized Governing Equations) sets theoretical basis for the later chapters. Chapter 1 "Introduction to Transport Phenomena," introduces the reader to the wide breadth of "multiphase systems," and treats their fundamental phenomena.

Chapters 8 (Condensation), 9 (Evaporation), 10 (Boiling), and 11 (Two-Phase Flow and Heat Transfer) are competitive with similar subject treatments in Carey (1992) and Collier and Thome (1994). However, these chapters tend to provide a broader coverage range than in the other books. For example, Chapter 8 includes the effect of micro-gravity, centrifugal forces, and capillary effects, and porous media. Chapter 9 (Evaporation) provides excellent treatment of evaporation from thin films and menisci. Chapter 11 also addresses evaporation and boiling in micro-channels. Although an excellent text book, the book does not attempt to be an up-to-date reference book, as an "authoritative source" for accepted design correlations.

Tabled fluid transport properties (S.I. units) are provided in Appendix B for 22 fluids. Very useful are the polynomial coefficients provided for curve-fit equations of the 22 fluids. Other handy tables of thermophysical properties are provided for gases and solids, as well as information on gas mixtures and liquid solutions.

The book has several nice added features, which will make it valuable to a course instructor. Each chapter contains example problems that illustrate use of the equations discussed. A well prepared solution manual that gives detailed solutions to all problems in the book is available to course instructors. A Microsoft PowerPoint "presentation package" is also available to instructors, who use the book for class instruction. The PowerPoint package provides a very complete package of slides for each chapter of the book. For example, the number of slides in Chapters 6, 8, and 11 are 209, 108, and 94, respectively. This could be very useful to an instructor planning to offer the course for the first time. The instructor could select preferred slides for each chapter, or augment the material, as appropriate.

In summary, this book is highly recommended as a textbook for the broad subject of "multi-phase systems." Its subject coverage area and technical content are superior to competing texts. The excellent solution manual provides solutions to all problems in the book. The curve fit equations for fluid transport properties will assist the student in solving problems. The PowerPoint package will be very useful to instructors of a new course offering.