



# Transport Phenomena in Multiphase Systems

*Amir Faghri, Yuwen Zhang*

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Engineering students in a wide variety of engineering disciplines from mechanical and chemical to biomedical and materials engineering must master the principles of transport phenomena as an essential tool in analyzing and designing any system or systems wherein momentum, heat and mass are transferred. This textbook was developed to address that need, with a clear presentation of the fundamentals, ample problem sets to reinforce that knowledge, and tangible examples of how this knowledge is put to use in engineering design. Professional engineers, too, will find this book invaluable as reference for everything from heat exchanger design to chemical processing system design and more.

- \* Develops an understanding of the thermal and physical behavior of multiphase systems with phase change, including microscale and porosity, for practical applications in heat transfer, bioengineering, materials science, nuclear engineering, environmental engineering, process engineering, biotechnology and nanotechnology
- \* Brings all three forms of phase change, i.e., liquid  $\leftrightarrow$  vapor, solid  $\leftrightarrow$  liquid and solid  $\leftrightarrow$  vapor, into one volume and describes them from one perspective in the context of fundamental treatment
- \* Presents the generalized integral and differential transport phenomena equations for multi-component multiphase systems in local instance as well as averaging formulations. The molecular approach is also discussed with the connection between microscopic and molecular approaches
- \* Presents basic principles of analyzing transport phenomena in multiphase systems with emphasis on melting, solidification, sublimation, vapor deposition, condensation, evaporation, boiling and two-phase flow heat transfer at the micro and macro levels
- \* Solid/liquid/vapor interfacial phenomena, including the concepts of surface tension, wetting phenomena, disjoining pressure, contact angle, thin films and capillary phenomena, including interfacial balances for mass, species, momentum, and energy for multi-component and multiphase interfaces are discussed
- \* Ample examples and end-of-chapter problems, with Solutions Manual and PowerPoint presentation available to the instructors

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