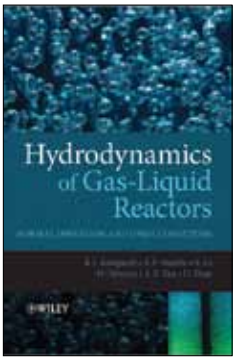
Books

Hydrodynamics of Gas-Liquid Reactors: Normal Operation and Upset Conditions



B. J. Azzopardi, D. Zhao, Y. Yan, H. Morvan, R. F. Muddle, and S. Lo, John Wiley & Sons, Hoboken, NJ, $195, 344 pages, Aug. 2011, ISBN: 978-0-470-74771-1

Multiphase (gas-liquid) chemical reactions are carried out in various types of reactors. The design of these reactors and their safety are as critical to the success of a chemical process as the actual chemistry that takes place in the reactor. This book provides a comprehensive overview of the practical aspects of multiphase reactor design and operations, with an emphasis on safety and clean technology.

The book is organized into three parts, with the first part devoted to the types of multiphase reactors and the methods used to design them. The chapters in this section delve into such subjects as bubble columns, sparged stirred vessels, thin-film reactors (falling film, rotating disc, two-phase tubular, and monolith reactors), macroscale modeling (multiphase computational fluid dynamics), and mesoscale numerical modeling using the lattice Boltzman method. These chapters provide a thorough review of the design methods for the bubble columns, sparged stirred vessels, and thin-film reactors discussed.

The next section considers upset conditions and methods to protect against their consequences. Beginning with descriptions of incidents that have occurred with various types of reactions and the reasons for these malfunctions, subsequent chapters address the behavior of reactor contents and the process of removing material (venting) from the vessel, as well as methods for calculating the limitation to flow that can occur at the relief device and the attached piping.

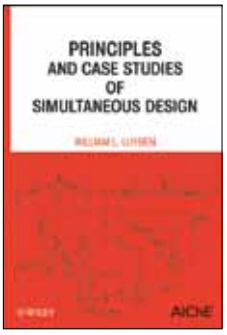
The book's final section discusses the measurement methods for many of the parameters that are relevant to these reactors.

Each chapter contains a selection of sample problems, along with many figures and references. The material is written by experts in their specific fields, including several from the U.K. and one from the Netherlands, who provide international perspectives.

This book will be useful to industrial practitioners and academic researchers involved with the design and operation of multiphase reactors, as well as to graduate students of chemical engineering doing research in this field.

— Stanley S. Grossel
Process Safety & Design Consultant, Clifton, NJ

Principles and Case Studies of Simultaneous Design



William L. Luyben, John Wiley & Sons, Hoboken, NJ, $150, 344 pages, Oct. 2011, ISBN: 978-0-470-92708-3

This book presents the general principles of process design, reinforced with examples of economic design and case studies of typically complex industrial processes.

The author shows readers how to build effective flowsheets and control structures, by presenting ten case studies that illustrate the methods and techniques essential to chemical process design in the creation of new facilities or the modification of existing plants. Readers will learn how these methods can be applied to reactive distillation, reactor design, plant design, and other chemical engineering processes. The scenarios provided include plantwide control studies and steady-state economic designs that minimize costs of both capital and energy. Detailed flowsheets and Aspen Plus files are included, along with examples of dynamic simulations using Aspen Dynamics.

Written in an approachable and easy-to-comprehend style, this book should be a valuable reference to student engineers, as well as to practitioners in the chemical, petroleum, and biochemical industries.

Convective Heat and Mass Transfer

S. Mostafa Ghiaasiaan, Cambridge Univ. Press, New York, NY, $135, 548 pages, June 2011, ISBN: 978-1-107-00350-7

Intended primarily as a graduate-level text, this book strikes a balance between presenting the theory and practice of convective heat and mass transfer, and such modern areas as flow in microchannels and computational fluid dynamics (CFD)-based design and analysis methods.

After introducing general concepts, the book progresses through topics including boundary layers; laminar internal flow; types of turbulence; the analogy among heat, momentum, and mass transfer processes; buoyancy-dominated flow; and microchannels. A later chapter is devoted to turbulence models — the bases of modern CFD tools.

The book includes end-of-chapter exercises, and the appendices provide some of the essential properties and mathematical information needed for analysis of convective heat and mass transfer processes.