examples for many different branches of engineering. In addition, it is used to connect a calculus course to the engineering curriculum. The project provided a particularly good introduction to engineering experimentation. Student design work on the project was good, but could be strengthened—particularly in the details of full design calculations and economic analysis.

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ChE book review

Modeling of Chemical Kinetics and Reactor Design

by A. Kayode Coker

2nd edition; 1095 pages plus CD-ROM; US $195. ISBN 0-88415-481-5 (2001)
Published by Butterworth-Heinemann, 225 Wildwood Avenue,

This book is intended as a reference volume by the author. Educators will find the book useful for several topics that are not covered by textbooks or other reference volumes.

In addition to standard chapters on residence time distribution and reactor models for non-ideal flow, there is an extensive chapter (91 pages) on mixing in tanks, mixing by static elements, and heat transfer in agitated tanks.

There is also a chapter (47 pages) that introduces the use of computational fluid dynamic simulators for studying mixing and flow in reactors. That chapter discusses examples of mixing and reaction in a stirred tank and flow in a radial flow catalyst bed. On the CD, there are beautiful and informative color images of transient mixing and reaction of a competitive-consecutive reaction in a stirred tank.

Other chapters in the book, which aren't covered or are covered only briefly by other books, include a chapter (80 pages) on biochemical reactions and reactors. There is an extensive chapter (134 pages) on safety, including descriptions of calorimeters used to characterize reactions, calculations of vent sizes, and a brief discussion of HAZOP analysis. Scale-up of reactors is considered in a chapter (47 pages) that discusses the use of dimensional similitude in combination with reactor models.

Another strong point of the book is the numerous examples that are worked in detail. Many of these example problems are supplemented by Excel spreadsheets and computer programs on the CD.

The CD also has a unit conversion program and PDF files with explanations of numerical methods and a cross-reference between examples in the book and supporting material on the CD. Source code (Fortran 77) for all of the software programs on the CD is included along with the executables. Unfortunately, temporary files produced during compilation (object, make, compiler interface) are also included, which (in addition to the lack of sub-folders in each chapter's folder) makes finding the file needed to run the program harder than necessary. A DOS program is available for calculating heats of reaction at reaction temperature with input of stoichiometry, standard heats of formation, and heat capacity formula coefficients. Other programs are Windows double-clickable executables that display text output in the output window and write output files to disk. A recommendation for future editions is to change the file extensions to "txt" from those used for the input ("dat") and output ("res") so that they can be accessed easily by double-clicking.

There are several topics that are not covered by the book. Other than brief mention and sketches in a chapter mentioning types of reactors, there is nothing on multiple-phase reaction systems. There is nothing on reaction-diffusion in porous catalysts or non-catalytic solids. There is brief discussion on pressure drop but none on the effect of pressure drop of gases on reaction rate. There are a couple brief discussions of selectivity and yield in two-reaction systems, but nothing on more complex multiple-reaction systems. The thermodynamics section would benefit from a worked example on reaction equilibrium composition. There are no end-of-chapter problems that can be used for student assignments.

Other chapters in the book cover standard material such as reaction mechanisms, analysis of kinetic data, design and comparison of the "ideal" reactor types, thermal effects, and residence time distribution.

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ChE letter to the editor

To the Editor:

Reference is made to the article by Ang and Braatz, "Experimental Projects for the Process Control Laboratory" [CEE, 36(3), p. 182, 2002]. The exercise that has to do with "dye concentration" can also be done with the control of a hot-water stream instead of a dye stream flowing into the tank. Just as a colorimeter indicates the amount of dye stream, so too can thermocoupling indicate the amount of hot-water stream; otherwise the experimental apparatus would be the same.

We find a convenience in not needing to deal with a dye stream disposal problem at the "Drain" indicated in their figure. Our water stream is collected and reused.

Dale L. Schruben
Texas A&M Kingsville

Author's Response

We agree that control of temperature using a hot-water stream is safe, with no waste disposal issues—which is why this is used in many control apparatuses (*e.g.,* as in apparatuses 5, 7, and 10 described in the article). An advantage of the dye concentration control experiment is that students can directly visualize the open- and closed-loop dynamics and the extent of nonideal mixing, as they observe the color changes in the tank.

Before constructing any apparatus, Materials Safety Data Sheets should be consulted for safety and disposal considerations for all chemicals that are intended for use in the experiments. The instuctional value of a particular apparatus with particular chemicals should be weighed against capital and operating costs and any safety or disposal issues. There are many internet resources for viewing MSDSs (*e.g.,* see <http://www.ilpi.com/msds/#Internet>).

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