

Heterogeneous Catalysis in Practice by Charles N. Satterfield, McGraw-Hill Book Company, May 1980, 416 pages; \$26.95

The book is an excellent and comprehensive treatment of industrial catalysis. This approach has been needed for some time for the engineers and scientists working in this field, both industrially and academically. I think what is said on the cover flap about the book summarizes my review to the fullest as far as the application of the text. The author does well to cover all practical fields of heterogeneous catalysis with enough insights for many applications of the subject matter.

The book should have a wide field of circulation, especially to the chemical engineers and chemists in all endeavors in the refining, petrochemicals, chemicals, and other allied fields where solid catalysis is an almost daily reality.

There were no major weak points except that a few more example problems should have been illustrated as well as the answers to the seventy-five (75) problems at the end of the text.

Summarizing my review, this is an excellent and long needed treatment of the subject matter, and I recommend it highly to anyone with any interest in practical heterogeneous catalysis.

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Gas-Liquid-Solid Reactor Design, Y. T. Shah, McGraw-Hill; 373 pages; \$44.00; January, 1979

Every engineer who is serious about optimizing the performance of multiphase reactors should find this an invaluable resource book. Numerous review articles and textbooks treat two-phase (gas-solid, gas-liquid, etc.) reactor design, but this is the first attempt to combine all three (gas-liquid-solid) into a single treatise. Although aimed more specifically at petroleum processing (hydrodesulfurization and hydrocracking of gas oils in trickle bed reactors, etc.), the book also contains vital information that can be applied to coal liquefaction, Fischer-Tropsch synthesis, and partial oxidations and hydrogenations that are carried out in slurry reactors.

The book is well organized into 9 distinct chapters. Each has at least one completely solved illustration, together with recommendations for additional work that needs to be done. Since so many different symbols are required in the correlations, Shah has used independent sets of nomenclature for each chapter. The 995 references (some are repeated in more than one chapter) give an indication of the thoroughness of the treatment.

Chapter 1 contains a lucid overview of the various reactor types, along with practical examples of each and some of their advantages and limitations. Many of the factors that influence reactor performance are identified: flow regimes, pressure drop, catalyst deactivation, several types of heat and mass transfer coefficients, intrinsic kinetics, temperature, etc. Each of these parameters is dealt with in detail in subsequent chapters.

Residence-time distribution is nicely covered in Chapter 3. A list of criteria for effective use of tracers in such measurements is presented, along with problem areas that arise both in practical application of the models and in scale-up.

Most of the theory is contained in the first 4 chapters; the remaining half of the book concentrates on applications. Twenty-three different types of multiphase laboratory flow reactors are described in Chapter 5, and the references are conveniently broken out into groups for each type. In spite of this multitude of reactor types, there are some omissions, such as transport bed reactors in which fluidized catalyst particles are moved continuously from one reaction zone to another, e.g. between oxidizing and reducing stages.

The dynamics of co-current/counter-current, upflow/downflow fixed bed column reactors are discussed in Chapters 6-8; the last (and most comprehensive) chapter deals with suspended solid (agitated, fluidized, pulsating bed) reactors. These chapters contain a myriad of useful empirical correlations that allow one to estimate transfer coefficients, pressure drops, axial dispersions, etc. under realistic conditions. The point is made that whenever possible the parameters should be measured experimentally, although Shah attempts to point out which correlations are most likely to be reliable under different reaction conditions. The discussion of slurry reactors is quite thorough in the last chapter.

As might be expected in a book covering such a wide range of topics, there are a number of specific items that have not been covered. Many printing errors exist, but hopefully these will be partially removed in later printings. In places the reading becomes tedious, although in general the descriptive parts are kept succinct and directly to the point.

I think this book represents a much needed synthesis of a vast amount of useful information in an extremely important field.

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