Book Reviews

Flow and Transport in Porous Media and Fractured Rock. From Classical Models to Modern Approaches. By Muhammad Sahimi (University of Southern California). VCH: New York. 1995. xiv + 482 pp. $65.00. ISBN: 3-527-29260-8.

Flow and Transport in Porous Media and Fractured Rock by Muhammad Sahimi is a recent addition to the collection of books that speaks to a cross-disciplinary audience, encompassing work from the petroleum, environmental, physical, and chemical sciences alike. If pressed to differentiate between books, one could conclude that Sahimi emphasizes modeling techniques, in contrast to Dullien's emphasis of physical phenomena and pore structure or the more mathematical approach of Bear or Scheidegger. Sahimi's niche seems to be appropriate for its time.

The first two chapters of the book move rapidly through introductory material (the basics for continuum versus discrete approximations, heterogeneity, and the equations of change constitute only ten pages), setting a tone that caters to the reader who is familiar with the basic subject matter. The core of the book begins in Chapters 3−5 with an in-depth look at pore morphology. A number of specialized topics are bridged in these chapters, covering the origin, characterization, and description of disordered media. The modeling approach is conspicuous in these chapters, evidenced by an emphasis on fractal analysis and percolation for both the characterization and description of media. The inclusion of these techniques does not, however, distance the topic of pore morphology from its fundamentals; a lucid explanation of diagenesis details the formation of natural consolidated rock, describing the origin of pore-scale heterogeneity and structure, while underscoring the fundamental differences between granular media (such as sandstone), carbonates, and fractured rock.

Chapters 6−8 are specifically oriented to modeling the porous materials described in the previous three chapters. While a large range of topics is discussed, pore-scale phenomena lie at the heart of the modeling chapters. Two of these three chapters are exclusive to models of the media (as opposed to transport), and although this topical division is effective in introducing key concepts regarding network structure, roughness, and scaling, it causes some discontinuity in subject matter. This is true especially for the network approaches (Bethe lattices and network modeling techniques), which may have been more cohesive were the networks presented together with the flow algorithms. Withstanding these criticisms, Chapter 8 contains a complete overview of the vastly different techniques that are used to model flow and transport, giving the reader the tools to compare and contrast volume averaging, continuum models, effective medium approximations, and a number of lattice-based models.

The final six chapters of the book are reserved for specific phenomena. In keeping with the author's background, dispersion is given an extensive treatment, focusing first on porous and then fractured rock. The first of these topics is the most detailed and descriptive chapter in the book, moving logically from the origin of dispersion in a disordered material, to its measurement and macroscopic effects. The macroscopic equations governing the process are described fully, and their relation to microscopic phenomena is central in the theme. The rich history of dispersion research is recognized in the presentations of dispersion in spatially periodic media, volume averaging, continuum models, and network models. Classic and recent developments in the analysis of dispersion tails are reviewed near the end of this chapter. Miscible and immiscible displacements comprise Chapters 11 and 12. Chapter 12 covers an impressive scope of multiphase modeling, sometimes at the expense of detail. However, this approach is probably appropriate for the book's audience, who may favor the succinct review of core subjects such as relative permeability, fractional flow models, and megascopic displacements. The last two chapters return to a more general treatment of unconsolidated beds and computational methods, respectively. The chapter on unconsolidated beds clearly illustrates their fundamental differences to consolidated natural rocks, which are the emphasis of previous chapters. References to experimental work are numerous, and a good overview is given of the more analytically derived models that have emerged from this area of research. Also discussed is one of the few topics in the book from classic chemical engineering literature, two-phase flows in unconsolidated packed beds.

As a complete story, *Flow and Transport in Porous Media and Fractured Rock* takes the reader through a broad, but concise, tour of research in this area. The subject divisions are fairly consistent with other treatises, but Sahimi expands the boundaries within each subject to encompass a greater diversity of approaches. While those wholly unfamiliar with porous media may desire a stronger foundation, the book is a valuable review comparing standard and advanced modeling techniques. A few subjects are discussed in detail, but most provide the reader with enough familiarity to choose a direction to attack in the literature. To aid this endeavor, Sahimi provides an up-to-date reference list of over 1000 published works, classic and current.

Karsten Thompson, *Louisiana State University*

H. Scott Fogler, *University of Michigan*

JA955197N

S0002-7863(95)05197-3

Organocopper Reagents, A Practical Approach. Edited by Richard J. K. Taylor (University of York, U.K.). Oxford University Press: New York. 1995. xii + 362 pp. $39.95. ISBN 0-19-855758-2.

The Practical Approach to Chemistry Series aims to provide laboratory guides suitable for researchers not familiar with areas it covers. The overall quality, detail, and value of its first volume—a "do-it-yourself guide" to one of the most important C−C bond-forming methods in modern organic synthesis, organocopper chemistry—sets a good standard for the series and bodes well for its use as both a reference and a working tool in organic laboratories. Contributions from recognized laboratories include all aspects of modern organocopper chemistry. Following an overview, chapters cover general procedures, reagents generated from active copper, organozinc-derived highly functionalized reagents, higher order cyanocuprates, conjugate additions accelerated by TMSCl, Lewis acid-mediated conjugate additions, asymmetric conjugate additions, tandem vicinal dialkylations, the Sonogashira coupling reaction, alkyne carbocupration, silyl- and stannylcuprates, and mechanistic studies of organocopper reactions. Most chapters are sprinkled with helpful practical hints for the chemist, and each contains a set of uniformly presented protocols. These unchecked protocols, somewhat reminiscent of those found in *Organic Syntheses*, include safety considerations and lists of equipment and materials. Typically they provide sufficient detail for confident execution by a novice, and in some cases offer excellent observational notes and handy data, such as R_f values for products. Generally each chapter contains up-to-date references through 1993 and, in some cases, into 1994. The overall work is enhanced by incorporation of an index and two appendices detailing a compilation of organocopper preparations and a list of suppliers. Typographical errors, transpositions of ratios, and redundant numbering of structures and equations, though inevitable in works of this type, are relatively few. Given the attractive pricing of the paperback edition—handily spiral-bound for easy reference in the laboratory—*Organocopper Reagents* will be a useful text for novice and veteran organocopper chemists alike.

Martin Hulce, *Creighton University*

JA955317R

S0002-7863(95)05317-0