BOOK REVIEW

Catalytic Chemistry

By Bruce C. Gates, Wiley, New York, 458 pp., 1992

The socioeconomic importance of chemical catalysis is immense by any objective standard. On that basis, one would expect a course concerning chemical catalysis to be taught routinely in all undergraduate chemical engineering curricula. This expectation, however, is not correct. Rather, catalysis is more typically taught, if at all, on an *ad hoc* basis in courses primarily concerned with kinetics and/or reaction engineering. This is due, at least partly, to the lack of an appropriate modern text. This book is intended to correct this problem, and on balance, I would say that it is moderately successful.

The text is organized such that five different general topics are discussed in the following order: (1) catalysis in solution, such as acid-base catalysis and organometallic (homogeneous) catalysis; (2) enzyme catalysis; (3) catalysis by polymers, both those functionalized with transition metal catalysts and microporous polymeric catalysts; (4) catalysis by shape-selective (nanoporous) inorganic materials such as zeolites; and (5) catalysis on heterogeneous surfaces. This is a well thought-out and logical progression from the simplest (the best understood mechanistically) applications to the most complex (the least understood mechanistically) situations. There are numerous examples and homework problems, generally well chosen, and there are adequate references that allow the reader to probe deeper into specific topics.

The strength of the book is in its breadth, rather than its depth, which is arguably appropriate for an undergraduate text. The various topics are well chosen, and the discussion is clear and extremely easy to follow. Since all of the material in the book could be covered in no more than seven weeks, a reasonable scenario would be to incorporate it into an undergraduate sequence consisting of kinetics (12 weeks), catalysis (7 weeks), and chemical reaction engineering (11 weeks), distributed over either three quarters or two semesters. In particular, a good kinetics course must be a prerequisite, since the short discussion of "kinetics" in this text is probably the poorest part of the book. For example, all that is said concerning collision theory is that the reaction rate is equal to an *undefined* collision frequency multiplied by a Maxwell-Boltzmann factor involving the activation energy of the reaction multiplied by an empirical fraction that "expresses a geometrical requirement for reaction." This is a tragic description of a beautiful theory. The discussion of transition-state theory is no better.

With this caveat, the text can nevertheless be recommended for incorporation into an undergraduate chemical engineering curriculum, as delineated above. The course would be useful both for a student seeking a terminal B.S. degree and for an undergraduate who intends to delve much deeper into related topics in graduate school.

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