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Book Review

Catalytic Conversion of Hydrocarbons. By J. E. Germain. Academic Press, Inc. New York, 1969, xi + 322 pp. $12.00.

This book presents a scientific review of catalytic reactions of pure hydrocarbons alone or with hydrogen, oxygen, water, or carbon monoxide. It is amazingly compact considering the breadth of coverage, and at times it is little more than an outline. Since there are about 247 pages of text and over 1,170 references, the average coverage per reference is quite brief. A very real effort is made to unify the experimental observations in terms of basic principles, including catalyst types (oxidation-reduction vs. acid-base), bond strengths, presumed intermediates, and reaction probabilities. The author has, however, refrained from oversimplification or exclusive presentation of particular theories.

Following a scanty chapter on thermodynamics and a condensed chapter covering together inorganic complexes, crystal-field theory, bonding types, semiconductors, metals, and acid-base catalysis, the two main chapters are presented. These cover reactions of carbon-hydrogen bonds and carbon-carbon bonds. Major topics here and in the final chapters are hydrogen exchange reactions, hydrogenation, dehydrogenation, hydrogenolysis, isomerization, alkylation, hydrogen transfer, polymerization, cracking, olefin dismutation, oxidation, and hydroformylation. In the discussion of these reactions Germain has tried throughout to explain the facts in terms of radical-like, carbonium ion, or carbanion intermediates. The book represents an organic chemistry approach to hydrocarbon conversions after the style of Ipatieff, to whom it is dedicated. Rather little attention is given to the problem of the nature of the catalysts themselves. Physical chemistry is limited mainly to remarks about kinetics and equilibria. Industrial applications are mentioned only in passing.

"Catalytic Conversion of Hydrocarbons" is a very useful, critical review of the recent literature. It is quite up-to-date, and covers publications originating throughout the world, including many from Russia. The difficult task of assigning historical priorities is not really attempted. Any reader will, however, be impressed by the amount of information that is coordinated by means of rules regarding reactions of radical-like and ionic intermediates. The reader should accept the rather abbreviated style of writing as a price paid for compactness, and must forgive the publisher for a few misspellings and typographical errors. This book should be of real value to serious students and to research workers.

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