

BOOK REVIEW

Catalysis by Nonmetals. By OLEG V. KRYLOV, translated by M. F. Delleo, Jr., G. Dembinski, J. Happel and A. H. Weiss. Academic Press, New York/London, 1970. x + 283 pp. \$14.00.

This valuable book seeks to provide the scientific basis for catalytic phenomena. As indicated in the title, it deals mostly with nonmetals, primarily from an electronic viewpoint. Adsorption, surface area, and related physical considerations are not mentioned. As stated in the preface, "The development of scientific principles for the selection of catalysts appears to be the central problem of the science of catalysis." The author has succeeded in providing a critical selection of information from the literature, both experimental and theoretical, and expounding with clarity the theme of the electronic theory of catalysis. This book is not a duplicate of other excellent books which have become available recently. It should serve and is recommended both for the student with a technical background, and the expert in catalysis.

Part I discusses properties of solid catalysts such as type of conductivity, the width of a forbidden zone of a semiconductor, work function, charge and radius of ions, electronegativity of atoms, the role of *d*-electrons, ligand and crystal field theory, acid-base properties of a surface and lattice parameters. Each topic is dealt with in an expert manner, the issues and status being clearly defined.

In Part II, the literature is examined for correlations between catalytic properties and the specific reactions of hydrogenation, dehydrogenation, oxidation, polymerization, isomerization, catalytic cracking, etc.

The appendix is entitled "Physical Properties of Some Nonmetallic Compounds Used as Catalysts." Consistent with the treatment of this

book, these include—type of crystal lattice, type of conductivity, width of forbidden zone, work function, and dielectric constant.

A comprehensive, selected list of 690 references is given, to the middle of 1964. Thus, it does not include the 1968 IV International Congress in Moscow. Unfortunately, certain significant information obtained in the last 6 years is not covered. Interestingly, about half of the references are Russian which serves both to provide a good selection of key Russian references, while also utilizing and correlating a wide variety of important non-Russian literature.

It should be recognized that this is not a book immediately useful to the industrial chemist in making a choice of catalysts. A clear indication of this is the author's statement in the preface that "Questions of the selectivity of catalysts are not considered." To many, it is the selectivity of a particular catalyst which determines its choice. The second criterion of choice of catalyst is stability in service which is also not considered. Thus Part II can give only guidelines based on the principles involved. Quite sophisticated criteria can now be applied to the choice, say, of a cracking catalyst. If there is an objection on the part of this reviewer, it is that the theory and practice of catalysis are still far apart. This book contributes to closing the gap.

The book is very legible and seems free of typographical errors (sites for cites Fig. 29). The translation appears excellent, no doubt due to the qualifications of the four experts in catalysis who acted as translators.

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