

Book reviews

Topics in physical organometallic chemistry Volume 1

M F Gielen (ed.)

Freund Publishing House Ltd, Tel Aviv and London.
1985. (212 pages) \$40.00.

This volume contains two chapters. The main chapter is a very well organised and nicely presented account by A. Dedieu on theoretical studies of chemical reactivity in organometallic systems. The chapter aims to bridge a gap between the theoretical and experimental points of view and discusses essential results of interest to the experimentalist rather than the technical details of the underlying calculations. This is just what the experimentalist wants. It consists of 141 pages with 369 references, coverage including some 1985 material. The article restricts itself to reactions, that is to bond making and/or bond breaking processes. Polytopyal rearrangement and fluxional processes are thus excluded. Topics that are covered include ligand replacement reactions, oxidative addition and reductive elimination formation and fragmentation of metallacycles, insertions and α or β elimination reactions, nucleophilic addition to unsaturated ligands, oxidation of hydrocarbons and catalytic processes. Much useful and interesting data are to be found in this chapter.

The second chapter is shorter and is an account of electrophilic substitution at saturated carbon in non-transition metal compounds, by M.H. Abraham (69 pages, 118 references). This review concentrates on the kinetic and mechanistic studies that have been carried out on simple alkyls of mercury(II) and tin(IV) and other IVB metals. This chapter contains a wealth of kinetic data and is an authoritative account of the topic.

The paperback is produced from camera-ready copy, but the quality of the articles is good. The quality of diagrams and figures in Chapter 1 is very good.

Practising organometallic chemists will find this book useful.

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Tailored metal catalysts

Y Iwasawa (ed.)

Reidel, Dordrecht. 1986. (332 pages) \$59.50; £42.95.

This book is the latest in the series *Catalysis by Metal Complexes*, published by Reidel, and well maintains the standards set in previous volumes. *Tailored metal catalysts* presents the state of the art concerning the design of heterogeneous catalysts as seen from the

standpoint of the application of concepts developed during the study of molecular organometallic chemistry. It is written predominantly by Japanese authors who are authorities in different aspects of the field and the subject matter is presented in five chapters.

The first chapter (Y. Iwasawa) provides a useful general introduction to the area of inorganic oxide-attached metal catalysts and illustrates the increasing sophistication with which the molecular chemistry has been applied in the development of first, second and third generation catalysts. It contains useful sections on types and properties of support materials (some of which information is duplicated in the third chapter), methods of functionalisation and of attachment of the metal-organic moiety, and appropriate physical techniques of catalyst characterisation. It provides a very good summary of the wide variety of organometallic molecules which react with inorganic oxides and functionalised surfaces to give well-characterised surface compounds. The chapter on polymer-attached catalysts (H. Hirai and N. Toshima) describes the details of their preparation and reactions and emphasises, quite rightly, the importance of due consideration to both polymer chemistry and catalysis chemistry in catalyst design. A useful section on polymer-protected colloidal catalysts is also included. The third chapter (R. F. Howe) reviews the chemistry of mononuclear transition metal carbonyl complexes on inorganic supports, their mode of decomposition and the catalytic properties of the resultant materials. This is a very readable account written by an author who has an intimate knowledge of, and has contributed significantly to, progress in this area during the last fifteen years. The fourth chapter (M. Ichikawa) is to some extent a natural extension of those of Iwasawa and Howe, and concerns the preparation and characterisation of heterogeneous catalysts using supported well-defined metal clusters. Not all their catalytic properties are described however, but particular emphasis is placed on their behaviour towards the hydrogenation of carbon monoxide and carbonylation reactions in general. The final chapter (A. Tai and T. Harada) provides a fascinating account of the predominantly Japanese work on asymmetrically modified nickel catalysts and the recent striking advances which have been made in rationalising the behaviour of some of these materials. It is indeed remarkable that a simple compound such as tartaric acid, when adsorbed onto a nickel catalyst, can recognise one of the enantio faces of a substrate with greater than 90% accuracy.

Overall, this is an excellent up to date book (with references to 1984/5 in most chapters), which is written

in a consistent style, relatively free from typographical errors and reasonably priced by present day standards. It is perhaps unfortunate that there is no contribution from an industrial chemist to provide a perspective on some of the additional factors which are key features of catalyst processing—chemical engineering requirements, catalyst lifetime and robustness under working conditions, sensitivity to poisons, etc. Some of these problems are hinted at throughout the book but they are not properly addressed. After all, however elegant the chemistry involved in tailoring or designing a catalyst, if its lifetime is only short under the required reaction conditions then it will be of little practical use.

Finally, the index to the book leaves much to be desired. For example, a casual glance would lead the reader to believe that no reference is made to any ruthenium containing compounds, which is certainly not the situation. In contrast 'evaporated rhodium', which occupies one sentence of the whole book, does merit a mention in the index! These reservations apart I have no hesitation in strongly recommending this book to both students of the design of heterogeneous catalysts at the molecular level and the wider fraternity of classical heterogeneous catalyst chemists.

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