

# Fundamentals of Kinetics and Catalysis

CONCEPTS OF MODERN CATALYSIS AND KINETICS

BY I. CHORKENDORFF AND J. W. NIEMANTSVERDRIET, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 2003, 469 pages, ISBN 3-527-30574-2; £50; €69

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“Concepts of Modern Catalysis and Kinetics” is a comprehensive textbook on heterogeneous catalysis aimed at students of chemistry, physics or chemical engineering. While not being specifically about platinum group metals (pgms), much of the theory, concepts and techniques covered are of relevance to pgm catalysts and some of the examples given are of catalysts containing pgms, although equally, many are not. It is thus of some relevance to readers of this Journal.

As I flicked through the book, my first impressions were good. The layout is clear with the text ordered into logical sections. Photographs, figures, diagrams and tables break up the text. As expected for a book with kinetics in the title, there are many equations. My initial impressions were confirmed when I began to read the book: the text is well written and easy to follow, with references provided for the reader who wants to know more. The text is enlivened by snippets of information and comment. For example, I learned that Arrhenius was studying sucrose hydrolysis when he proposed his equation, while the breakdown of alcohol in the body by alcohol dehydrogenase is described as of “some special appeal to students”.

This is a book aimed at students, although as so often is the case with specialised books, the price may put it out of the reach of some potential readers, but a paperback version might remedy this. However, I consider that the book goes beyond the needs of undergraduates as it contains far more material than would be covered in a first degree course. The book would also be suitable for someone entering catalysis research for the first time or as a reference for the experienced researcher.

The text starts with an introduction entitled ‘What is catalysis’. It then continues with chapters on kinetics (mostly the reactions of gases in het-

erogeneous catalysts, but enzyme catalysis is also mentioned), reaction rate theory (including partition functions, collision theory and transition state theory), characterisation techniques, material properties and catalyst preparation and testing, surface reactivity (mostly on electronic aspects) and the kinetics of surface reactions (mechanism and microkinetic modelling). This concludes the chapters on general concepts and theory, which form the bulk of the book. The remaining three chapters cover real-world applications of catalysis, for example, generation and use of hydrogen (including fuel cells), refining and petrochemistry, and environmental catalysis (including automotive catalysts). These three chapters are intended to be an overview rather than a comprehensive account, and the reader is referred to more specialist literature for further information. Finally, as expected for a student textbook, there is a section of questions and exercises.

Important applications of the pgms covered in this book include bifunctional reforming catalysts, fuel cells and automotive exhaust catalysts. It is particularly pleasing to find a catalysis textbook which gives automotive exhaust catalysts more than a token page. The section on three-way catalysts covers the principles of operations, how a lambda sensor works, monolithic supports, the roles of the various components in the formulation, modes of deactivation and some detail on the mechanism of CO oxidation and CO-NO reactions. This section would form a useful introduction to someone new to the field.

If you are looking for a good textbook on heterogeneous catalysis, “Concepts of Modern Catalysis and Kinetics” is well worth considering. It is certainly a book I would have liked to have read when I started in catalysis research.



**The Reviewer**

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