

Book Review

***Rhodium Catalysed Hydroformylation*, Edited by P.W.N.M. van Leeuwen and C. Claver, Kluwer, Dordrecht, 2000, pp. xii + 284. ISBN 0-7923-6551-8; GB£ 78, US\$ 125, NLG 235**

To attempt to cover, even in the form of highlights, the enormous field of metal-catalysed hydroformylation is a mighty task. The topic holds interest for both organic and organometallic chemists in academia, and has been the subject of myriad patent applications underlining the industrial pertinence of its development. Any effort to produce a specialist text on the topic would have to embrace aspects of both these approaches. Indeed, the amount of work required has clearly prevented a publication such as this arriving before the 21st century. Even paring the field down to specifically rhodium-based catalysis is no mean feat and it is a credit to the editors (who are also major contributors) and the various authors that they have successfully achieved this and in a short timescale.

The multi-author text is divided into ten chapters as follows: introduction; hydroformylation with unmodified rhodium catalysts; rhodium phosphite catalysts; phosphines as ligands; asymmetric hydroformylation; hydroformylation in organic synthesis; aqueous biphasic hydroformylation; process aspects of rhodium-catalysed hydroformylation; catalyst preparation and decomposition; and novel developments in hydroformylation.

The introduction, which chronicles industrially significant advances in hydroformylation, is rather cursory. The final section entitled *Ligand Parameters*, being particularly brief, does not do justice to this important topic. In contrast, the remaining chapters constituting the meat of the book do the field justice, with perhaps one exception concerning the penultimate chapter (see below). Those on unmodified rhodium catalysts, and phosphite and phosphine donor systems set the tone with concise writing, extensive referencing and well-chosen examples and schemes. The emphasis is on highlights, but, where necessary, a generous discussion of structure-reactivity relationships and mechanism (largely through analysis of kinetic data, isotopic labelling and in situ spectroscopy) is included. The data are treated sensibly and those less familiar with the field

are guided skilfully through mechanistic arguments. This is commonly a frustrating experience and is a credit to the contributors who have clearly carefully considered the presentation of mechanism. The chapters are not only self-contained but expertly linked and interrelated to the remainder as and when appropriate. Indeed, this is a most gratifying feature of the book. All too often multi-author texts fall short of achieving a truly unified approach and it is of great credit to all contributors that it has been managed so successfully here.

Unlike the early chapters that concentrate on the production of linear aldehydes (the important bulk feedstocks) with a more industrially relevant theme, the chapters on asymmetric hydroformylation and hydroformylation in organic synthesis are concerned with fine chemicals. Here the emphasis is on systems that selectively generate branched aldehydes. Successful approaches to catalytic hydroformylations alluded to in the earlier chapters are again in evidence, with a varied selection of examples of applications of catalysis in the synthesis of synthetically and commercially valuable small molecules. The asymmetric catalysis section deals with ligand design and subsequent control of the resulting complex geometry to induce the required stereoselectivity, whereas the succeeding chapter concentrates on examples relating to the previous chapter and pertinent literature for relevant mechanism or theory. This approach is very readable and works well.

The penultimate chapter on catalyst preparation and decomposition is again rather cursory and does not do justice to these important aspects. Catalyst stability is a major contributor to the economic viability of homogeneous catalysts and the topic of catalyst decomposition is one that is often ignored. Decomposition pathways are becoming better understood with a number of them being the subject of recent studies, though the examples chosen do tend to look a little tired. Notwithstanding this observation, the editors are right to include this topic here; it should certainly raise some awareness in those who have not previously considered its importance.

In conclusion, *Rhodium Catalysed Hydroformylation* is an excellent text that should be on the bookshelves of any academic or industrial chemist with

related interests. It will certainly be a very valuable addition to any library. Specialists will already be familiar with much of the content, but it remains an essential reference book. This book will undoubtedly be of most use to established academics, industrial chemists and students who are considering entering the area; to these it will be a seminal text. As general background reading for those with broader interests in applications of transition metal catalysts, this book is

highly recommended and is a very good addition to the series.

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