Handbook of Heterogenous Catalytic Hydrogenation for Organic Synthesis. By S. Nishimura. Wiley: Chichester, **2001**, Clothback $185; ISBN 0-471-39698-2, 664 pp.

Catalytic hydrogenation accomplished by heterogeneous catalysts is undoubtedly a widely used method in research laboratories and industries, mainly due to its advantages over homogeneous catalysis: the stability of the catalyst, the ease of separation of product from it, a wide range of reaction conditions to selectively carry out a particular hydrogenation.

This book, as the title points out, is basically intended to provide accurate experimental procedures and guidelines to the chemist who plans to perform a catalytic hydrogenation during a synthesis. The topic presented in the handbook is fully detailed. Many examples of the hydrogenation of various functional groups are illustrated in schemes and in equations. A difference is made between the two; in equations, the reactions are described with complete experimental conditions, while in schemes, the reactions are generally illustrated to clarify reaction pathways and the selectivity of the catalyst used. A rich number of tables is inserted in the chapters, where the factors affecting the product distribution and the rate of the hydrogenation are presented. Mechanistic aspects of hydrogenations are a very limited feature of this book and only fundamental and industrial transformations have been supplied with mechanistic details.

The handbook consists of thirteen chapters: each chapter describes the hydrogenation of a particular type of functional group. References to the original literature and the fundamental reviews are placed at the end of each chapter. At the end of the book a general bibliography has been reported consisting of the principal textbooks in the area of catalytic hydrogenations. As the author notes in the preface, the references are by no means comprehensive and literature up to 1998 is covered.

Chapter 1 provides a list of detailed experimental protocols for the preparation of commonly used catalysts, 'Raney Ni' and 'Pt black' and numerous transition metal heterogeneous catalysts.

Chapter 2 completes the introduction giving literature sources. Furthermore, a general outline of the most important parameters (inhibitors, poisons, promoters, nature of solvent, temperature and H_2 pressure), which affect the success of hydrogenations is presented.

The hydrogenation of alkenes (the most frequently hydrogenated group) is described in Chapter 3. The chapter is subdivided into three sections. Firstly, the ease of hydrogenation of various substituted olefins is covered. The second section focuses on the stereochemistry, with examples of the hydrogenation of policyclic unsaturated molecules. Finally, selective hydrogenations performed in the presence of different functional groups are shown.

Chapter 4 deals with the hydrogenation of alkynes and a comparison is made with Pd (Lindlar's catalyst), Ni, and Fe catalysts' activity and their *cis*/*trans* selectivities.

Chapter 5 is devoted to the hydrogenation of aldehydes and ketones. The reaction conditions for the conversion of aliphatic and unsaturated aldehydes to alcohols are examined. The hydrogenation of functionalised ketones is presented in the the rest of the chapter. Many examples concerning the stereoselectivity in the hydrogenation of cyclohexanones are included and a mention is given to enantioselective hydrogenations.

Chapter 6 examines the preparation of amines. The most extensively applied process is The reductive alkylation of ammonia and amines with carbonyl compounds being the most extensive. The other approach, reported for the synthesis of secondary and tertiary amines, concerns the alkylation of primary and secondary amines with alcohols. Finally, the reductive asymmetric amination of α-oxo acids with chiral amines to produce enantiomerically enriched α-amino acids is illutrated, accompanied with an example of the asymmetric synthesis of cyclohexylamines. An alternative access to amines, mainly used in industry, is covered in Chapter 7, the hydrogenation of nitriles. Selective conditions are illustrated to obtain different products (primary, secondary and tertiary amines, aldimines, aldehydes). Interestingly hydrogenation accompanied by side-reactions, which in some cases can be of synthetic utility is also highlighted.

In the two following chapters (8 and 9), the hydrogenation of less common 'nitrogen containing' functional groups (oximes, hydrazones, nitroso derivatives) and the most frequently found nitro and imine groups are fully examined in 100 pages.

Chapter 10 covers the hydrogenation of carboxylic acids, esters and related compounds.

Chapter 11 is one of the longest and it covers the hydrogenation of aromatic compounds. The grade of hydrogenation and the stereochemistry of the substituted products are described. A section is devoted to the hydrogenation of phenols and phenyl ethers. The conclusive part deals with the hydrogenation of different classes of aromatic compounds (carboxylic acids and esters, arylamines, naphthalenes, polynuclear benzenes). Chapter 12 detailes the hydrogenation of heterocyclic aromatic derivatives.

The last chapter is one of the most important from a synthetic point of view, dealing with hydrogenolysis. The hydrogenolysis of various types of bond is discussed in separate sections: C–O, C–N, C–X (X = halogen), C–C and hydrogenolysis of organic sulfur compounds.

There are some typographical and structural errors in the book (Table 13.11, entry 2; equations 3.46, 5.1, 5.5, 5.6, 8.47, 9.86, 12.32).

As a general remark, the handbook can be considered as a stand point of reference and very useful experimental source of information for the preparation of the catalysts and the reaction conditions required for the heterogeneous hydrogenation of all functional groups. It is a welcome and valuable day-to-day manual for both academia and industry researchers.

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