Landmarks in Organo-Transition Metal Chemistry

Landmarks in Organo-Transition Metal Chemistry—A Personal View, by Helmut Werner, is a very informative and exciting account of the historical development of organo-transition-metal chemistry from the 19th century up to the present.

There have been rapid advances in the field of organometallic chemistry since the discovery of sandwich complexes by E. O. Fischer and G. Wilkinson nearly 60 years ago. Werner witnessed these advances first-hand as a diploma student under the tutelage of F. Hein, and subsequently as a PhD student of E. O. Fischer, and he has himself made remarkable contributions to this field during the last 50 years. His profound knowledge is reflected in the book, which details in an impressive and precise way the most important discoveries in the field of organo-transition-metal chemistry, from the 19th century to the present day, along with biographies of the scientists concerned. With regard to scientific content, the author has limited the scope of the book to a description of the most important classes of organo-transition-metal compounds, rather than their applications in organic synthesis, presumably to keep the extent of the work within reasonable bounds.

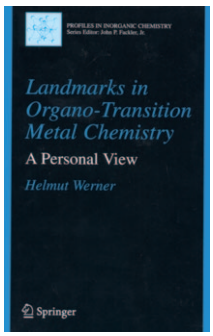
The book is divided into ten chapters, the subject matter of which is made easily accessible by the orderly arrangement of the contents. In the prologue, the author discusses his own research work as a PhD student in E. O. Fischer's group, which sparked his interest in the chemistry of polyene and polyenyl complexes. He tells in a captivating way how a fateful event at the end of his PhD studies led him to co-author, with E. O. Fischer, the widely cited book *Metall-π-Komplexe mit di- und oligoolefinischen Liganden*. It was this work that stimulated his great interest in the historical perspectives of organometallic chemistry, laying the foundation for the present comprehensive work.

The second chapter sketches the autobiographical details of the author. Helmut Werner tells in a modest and insightful way of his childhood, his school career, his studies in chemistry at the University of Jena, the period he spent in E. O. Fischer's group in Munich leading to his PhD thesis and appointment to a lectureship, his first professorship in Zürich, and the successful research career spanning a period of 25 years at the university of Würzburg following his appointment to the chair of inorganic chemistry in 1975. The vivid detailed description of the most important experiences in his life, illustrated by interesting photographs, gives memorable and instructive insights into the author's eventful life. One such experience was when the post-war political climate forced Helmut Werner to discontinue his early PhD studies under Franz Hein, leave his family, and flee from Jena. The second chapter ends with biographies of Franz Hein and Ernst Otto Fischer, the two scientists who played the biggest part in molding the author's career.

In Chapter 3, the reader is taken back to the very beginning of the history of organometallic chemistry. The author describes the progress in fundamental organometallic chemistry during the 19th century, from the isolation of the first metal alkene complex by W. C. Zeise and the pioneering work of E. Frankland on organo-zinc compounds to the groundbreaking discovery of the Grignard reagents and the isolation of the first carbonyl complexes by P. Schützenberger and L. Mond. The informative account is supported by well-researched citations of original publications. The chapter ends with biographical sketches and photos of the scientists who are highlighted.

Chapter 4 deals with the development of the chemistry of carbonyl complexes during the 20th century. Beginning with a discussion of the rudimentary structural proposals for metal–carbonyl complexes that existed at the beginning of the 20th century, the author describes the groundbreaking work of W. Hieber in the 1930s, which marked the start of the pivotal role of metal–carbonyl chemistry between 1930 and 1960. He continues by describing further developments in the field of carbonyl chemistry between 1960 and 2000, highlighting, amongst others, the work of J. Ellis on multiply-reduced carbonyl metallates and the work of H. Wilner and F. Aubke on metal–carbonyl cations. The chapter ends with a description of the sensational work on metal–carbonyl clusters by P. Chini and J. Lewis, and the first industrial applications of metal–carbonyl complexes by O. Roelen and W. Reppe. Chapter 4, as well as subsequent chapters, contains memorable and precise information enriched by chemical schemes, photos, and biographies of the most important protagonists. This is supported by a large number of citations of original publications, which stimulates the reader to delve into a more rigorous study.

In the next five chapters, the author describes the rapid development of organo-transition-metal chemistry after the Second World War by concentrating on the most important classes of compounds. Thus, Chapter 5 is devoted to the study of sandwich complexes, Chapter 6 provides an overview of the chemistry of triple- and multi-decker complexes, and Chapter 7 focuses on the development of work on alkene complexes. That is followed by the longest chapter in the book (Chapter 8), describing the chemistry of transi-



Landmarks in Organo-Transition Metal Chemistry
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tion-metal carbene and carbyne complexes. Finally, Chapter 9 deals with transition-metal alkyl and aryl complexes. These five chapters constitute a precise and riveting chronological account of the most important discoveries, revealing the author's profound knowledge accumulated over several decades. A few illustrative examples should be mentioned here: the structural elucidation of ferrocene by E. O. Fischer, G. Wilkinson, and R. B. Woodward (Subchapter 5.1); the isolation of bis-(benzene)chromium (Subch. 5.3); the unlocking of the structure of Hein's "polyphenyl chromium compounds" (Subch. 5.4 and 5.5); the groundbreaking contribution of M. Dewar and J. Chatt to the understanding of metal–olefin bonding through the formulation of the Dewar–Chatt–Duncanson model (Subch. 7.3 and 7.4); G. Wilke's brilliant work on homoleptic nickel(0)–olefin complexes (Subch. 7.7); the search for divalent carbon compounds (Subch. 8.1 and 8.2); the isolation of transition-metal carbene and carbyne complexes by E. O. Fischer (Subch. 8.3 and 8.4) and R. R. Schrock (Subch. 8.7); and the development of the chemistry of transition-metal alkyl and aryl compounds (Subch. 9.2 to 9.6).

It is not only the comprehensive description of the historical development of the most important classes of organo-transition-metal compounds that makes this book so valuable for chemists and advanced students, but also the many references to original publications, the descriptive figures, and the scores of images and biographical sketches of the protagonists that make the book by Helmut Werner so valuable, worth reading, and unique.

In Chapter 10, the epilogue of his book, the author looks back on his 50-year career as a successful researcher and academic, and makes a plea for fundamental, purely curiosity-driven, research. One can certainly congratulate Helmut Werner and thank him for the present comprehensive work, which can be considered a crowning achievement to his academic contributions, chronicling the milestones of an active field of chemistry that blurred the division between inorganic and organic chemistry.

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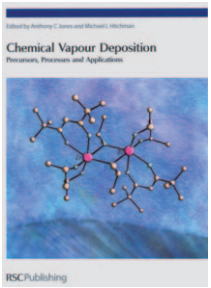
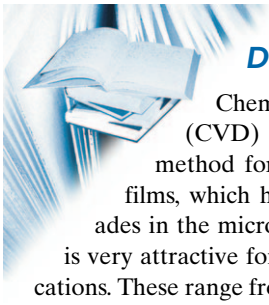


Chemical Vapour Deposition
Precursors, Processes and Applications. Edited by Anthony C. Jones and Michael L. Hitchman. Royal Society of Chemistry, Cambridge 2008. 600 pp., hardcover £199.95.—ISBN 978-0854044658



Chemical Vapour Deposition

Chemical vapor deposition (CVD) is a very powerful method for the preparation of thin films, which has been applied for decades in the microelectronics industry, and is very attractive for other challenging applications. These range from functional coatings on glass, production of LEDs in the visible and IR regions, high-frequency devices based on Group III–V elements, and photovoltaic and solid oxide fuel cells to the fabrication of nanostructures. Various books on CVD and materials are available, but they are mainly focused on a specific target, on fundamentals, or on specific materials such as oxides, metals, etc.

Chemical Vapor Deposition—Precursors, Processes and Applications, edited by Anthony C. Jones and Michael L. Hitchman, contains 13 chapters by a total of 27 authors, most of whom have several decades of experience in the field. In their preface, the editors describe the book as a tool "written with the CVD practitioner in mind, such as a chemist who wishes to learn more about CVD process technology, or a CVD technologist who wishes to increase his/her knowledge of precursor chemistry. This book should prove useful to those who have recently entered the field, and certain aspects of the text may also be used in chemistry and materials science lecture courses at undergraduate and postgraduate levels".

In my opinion, they have certainly achieved their goal! The book will prove a valuable resource for anyone working in the area, and could serve as a source of information not only for scientists working in academia but also for executives in charge of research and development in companies. It contains a wealth of useful references and good indexes, and thus it represents a landmark in a rich subject that has seen many developments over the past few decades. Since the book takes the reader through the various aspects of CVD and related areas, from fundamentals to specific processes and applications, it will be intellectually appealing for students. In addition, for students new to the chemical vapor deposition field, the excellent bibliography at the end of each chapter provides suggestions for further reading that are necessary for a deep understanding of the subject. The book is structured to provide fundamentals and basic concepts in CVD and guidelines for specific applications in the synthesis of thin films, with emphasis on the techniques involved in the deposition methods.

The book is essentially divided into two parts, the first on basic concepts, such as the various types of CVD processes, the design of CVD reactors,