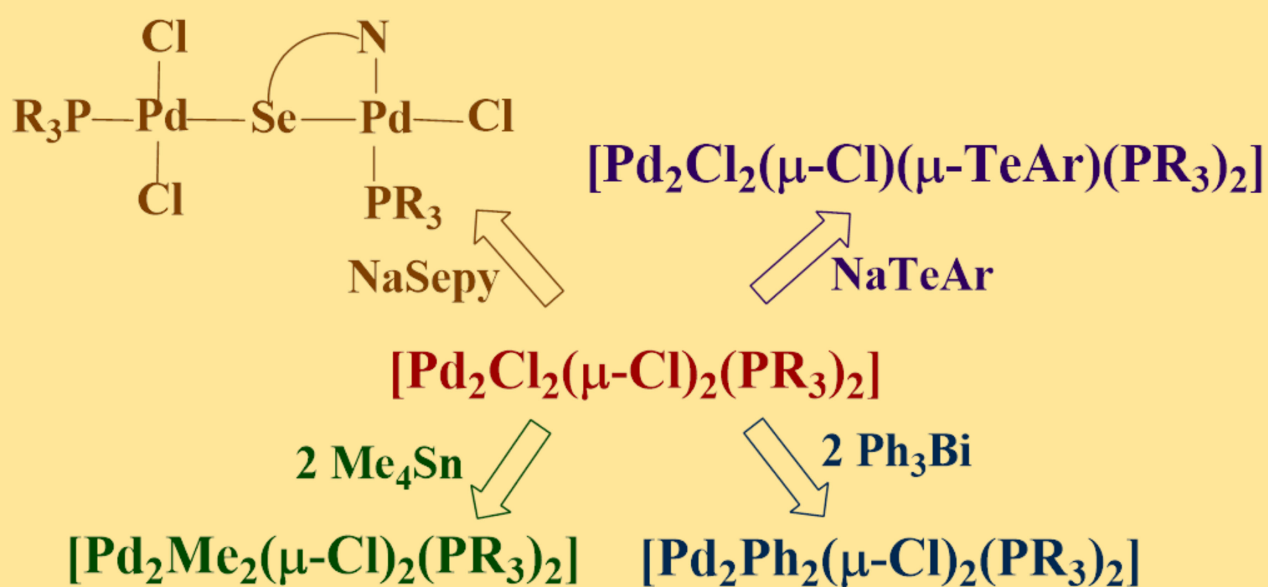


An Introduction to **ORGANOMETALLIC CHEMISTRY**

Fundamentals and Applications



Vimal K. Jain



An Introduction to

Organometallic Chemistry: Fundamentals and Applications

First Edition

Author

Dr. Vimal Kumar Jain



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Dedicated To

My Wife

Dr. Mrs. Leela Jain



Preface

Organometallic chemistry, a relatively young sub-discipline of chemistry, deals with compounds containing direct metal-carbon (M-C) bonds. It emerged at the interface of organic and inorganic chemistry but now virtually intersects with all the branches of chemistry and materials science. Organometallic chemistry has made great strides after the second half of the 20th Century. Exponential growth of organometallic chemistry can be seen with the development of superior homogeneous organometallic catalysts. Recent advances in materials science particularly in electronic industry and as OLEDs and their utility in biological sciences has further expanded the scope and horizon of organometallic chemistry. A testimony to this meteoritic rise of organometallic chemistry is the publication of ‘Comprehensive Organometallic Chemistry’ multi volume sets published regularly since 1982, IV edition published in 2022. The persistent and consistent dynamism of the field is further evident by the fact that the organometallic chemistry was honoured with three Nobel Prizes (in 2001, 2005, and 2010) within the first decade of this century.

Organometallic chemistry is an integral part of the major discipline ‘Chemistry’ at advanced undergraduate and post-graduate level in almost all the universities/ IITs / IISERs and other academic institutes in the country. Therefore, while preparing this textbook, the syllabus of organometallic chemistry of various academic institutions was kept in mind. The emphasis on the research component at master’s level given in the National Education Policy-2020 has also been considered. In the light of these factors, the contents of the book were worked out. The contents are clearly structured and organized in such a way that the book can serve as a textbook for a one-semester course for master’s degree in chemistry and can also provide background material for teaching and professional chemists. Primary references given at the end of each chapter, will assist students to plan their project work and further reflect on their chosen field.

This textbook provides historical background and covers fundamental concepts. General synthesis, structure and bonding of various types of organometallic compounds formed by main group elements and transition metals are discussed. General reactivity of organometallic compounds and their applications in organic synthesis (both stoichiometric and catalytic), biology & environment and materials science are covered. All these aspects of organometallic chemistry are organized in fifteen chapters, each highlighting basic concepts and growth of the area. As the subject area is too wide and diverse, attempts are made to cover essential concepts, without excessive details, of organometallic chemistry required for a typical university postgraduate level teaching. Nevertheless, a

balanced approach on the contents with the latest advances in the area was adopted so that both teacher and students can get involved with the topic and start building their own ideas. The presentation of each chapter is straight and for clarity chemical structures, formulae, illustrative figures and reaction schemes are given.

Students were the driving force to write this textbook. During COVID-19 when the classroom teaching changed from chalk-board to online mode. All the lectures were converted to PowerPoint presentation and lecture notes in electronic form. Several students, particularly at far off places, could not have access to the books; so, the course material was circulated to them. This material after due deliberation and consideration of syllabus of other academic institutions is presented in the form of this textbook with a focus to inculcate scientific interest in students and motivate them to pursue their career in chemical research. Organometallic chemistry offers numerous opportunities in health care, materials science, chemical industry, environment, etc.

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On a personal note, I am deeply grateful to my wife, Leela Jain, my daughters, Anita and Shweta, my sons-in-law, Madhusudanan and Ashwin, and my grandson, Vihaan, for their constant love. Finally, I remain forever indebted to my parents, teachers, and mentors for instilling in me the core values of education and integrity.

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