

Book Review

“Inorganic Chemistry (A Modern Treatise)” by D Banerjee (formerly Sir Rashbehary Ghose Professor of Chemistry, Calcutta University, Kolkata), 2012, pp. xi + 1779, Asian Books Pvt. Ltd., New Delhi, Price: Rs 2195.00. (ISBN 978-81-8412-166-7).

This book is an up-to-date and fairly comprehensive text dealing with the chemistry of elements. The subject area, one of the oldest scientific discipline, has grown from extraction and refining of elements to a wide and diverse exotic chemistry. On the one hand it encompasses areas like organometallic, bio-inorganic, solid state and materials chemistry, while on the other, inorganic compounds find innumerable applications in organic synthesis as catalysts, nanoscience and nanotechnology and influence even our day-to-day life. The author, a well renowned professor of inorganic chemistry, has presented such a mammoth subject in a commendable and systematic manner in this book.

The book comprises 28 chapters and ten appendices. The first chapter ‘A brief history on the origin and progress of inorganic chemistry’ is thought provoking and generates a lot of interest for further exploration of the history of inorganic chemistry. The author has succinctly covered periodicity and periodic classification of elements in Chapter 2 with historical background on discovery of elements. Usefulness of and anomalies in the Periodic Table are also included in this chapter. Occurrence and methods of isolation/ purification of elements are described in Chapter 4. This chapter provides general metallurgical processes for isolation of elements rather than covering detailed processes for each element, which are included to a large extent in the chapters dealing with the chemistry of a group. Chapter 3 on ‘Atomic Nucleus and Nuclear Reactions’ is presented in a balanced manner including a brief history, definition of various terms, radioactive disintegration, isotopes and their separation, nuclear reactions and nuclear reactors, etc. Such a wide subject of considerable interest has been carefully crafted and lucidly discussed.

Chapters 5 to 23 present the chemistry of elements group-wise. These chapters follow a general trend—occurrence and abundance of elements in nature, some important physical properties, electronic configuration, preparation of elements and their chemical reactions, their compounds in particular with hydrogen, oxygen and halogens and structures of important derivatives followed by applications of both elements and some of their compounds. The chemistry of elements at the interface of other disciplines like organometallic chemistry, biology (bioinorganic chemistry), materials science, catalysis (e.g., Ziegler-Natta polymerization) is also included, when relevant, in appropriate length. Organometallic compounds such as alkyls, cyclopentadienyl and carbonyl compounds, etc., are discussed in several chapters. Bonding in several compounds including complex molecules, like boranes, carboranes, carbonyl clusters, etc., using both classical and MO models, has been discussed appropriately. Chemical/ molecular structures (e.g., boranes and carboranes in Chapter 8) for numerous compounds have been given which help in comprehending the subject matter with clarity. Ligand chemistry of elements in Group 15 (N, P, As) and 16 (O, S), an important aspect for inorganic chemists, has been elaborated in Chapters 10 and 11 making them unavoidably voluminous (e.g., Chapter 10!). Inorganic compounds such as silicates, phosphates, oxy-acids of sulfur, vanadates, chromates, molybdates and tungstates, inter-halogen compounds, Zintl anions of Group 14 and 15, of general interest are also discussed. Electronic spectra of f- and d- block elements are discussed briefly in the respective chapters. Recent subjects like fullerenes and their compounds and carbon nanotubes with structures, are discussed. The chemistry of elements, which is so vast and diverse, is covered in a clear and concise manner in these chapters.

Chapters 24-28 cover various aspects of inorganic chemistry. Chapter 24 deals with the structure of solids, in particular inorganic compounds, and covers clathrates and cages, alloys and intermetallics, superconductivity and bonding. Structures of ionic compounds are discussed with the aid of illustrations.

Chemical reactions, including the rate and equilibrium concept, is presented in Chapter 25. Acid and base concept is an important and useful concept which is aptly described in Chapter 26. In this chapter, Brönsted-Lowry, Lewis and Hard & Soft Acid & Base concepts, pH scale, buffers and acid-base titrations are discussed. Oxidation and reduction reactions which are of relevance in bio-inorganic chemistry, catalysis, etc. are brought out in Chapter 27. Reactions in non-aqueous inorganic solvents, such as liquid ammonia, liquid sulphur dioxide, etc., are presented in Chapter 28.

There are ten appendices and all are very useful and relevant to the subject matter. Various units and inter-conversion of different units are given in Appendix I, while appendices VI and VIII summarize mineral resources of India and function and toxicity of the elements in biological systems, respectively. Magnetic behaviour of substances and molecular symmetry are briefly given in Appendices IX and X, respectively.

The text is supported by tables, figures, chemical structures and reaction equations which make the reading of this book enjoyable. The author has provided primary references within the text for further reading and these references are as recent as 2011. The easy availability of these references makes this

book more than a text book, giving students an opportunity to evolve the subject matter further at least for project works.

This colossal work has been carefully prepared. There are a few printing errors which can be taken care by providing an errata with the book. Some of the chemical structures need corrections. For instance, on page 286 the chemical structure for the nickel complex needs re-drawing as the two chelate rings are dissimilar. On page 1330, in the structure of the platinum complex (b) there are three interconnected oxygen atoms which should be replaced by a carboxylate group. Such trivial defects do not undermine the immense utility of this book, not only to students but also to those who would like to have an overview of the subject.

In summary this book is an excellent resource material and is recommended for teaching inorganic chemistry at post graduate level.

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