

The Rare Earth Elements: Fundamentals and Applications

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Lanthanides are of great importance for the electronic industries, this new book (from the EIBC Book Series) provides a comprehensive coverage of the basic chemistry, particularly inorganic chemistry, of the lanthanoid elements, those having a 4f shell of electrons. A chapter is describing the similarity of the Group 3 elements, Sc, Y, La, the group from which the lanthanoids originate and the group 13 elements, particularly aluminum, having similar properties. Inclusion of the group 3 and 13 elements demonstrates how the lanthanoid elements relate to other, more common, elements in the Periodic Table. Beginning chapters describe the occurrence and mineralogy of the elements, with a focus on structural features observed in compounds described in later chapters. The majority of the chapters is organized by the oxidation state of the elements, Ln(0), Ln(II), Ln(III), and Ln(IV). Within this organization the chapters are further distinguished by type of compound, inorganic (oxides and hydroxides, aqueous speciation, halides, alkoxides, amides and thiolates, and chelates) and organometallic. Concluding chapters deal with diverse and critically important applications of the lanthanoids in electronic and magnetic materials, and medical imaging.

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Editorial Review

Review

“In conclusion this is a valuable book, spanning the under-graduate / postgraduate divide, which should find a place particularly in the collections of those who teach lanthanide chemistry and new researchers to the field who want to discover the remarkable scope of modern lanthanide chemistry and its exciting applications. One could not expect much more in a single volume.” (*Applied Organometal Chemistry*, 1 May 2013)

From the Back Cover

Lanthanides [or Lanthanoids] are the elements with atomic numbers 57 to 71 on the Periodic Table. The sequential filling of their 4f electron shell gives them specific chemical and very unique spectroscopic properties. These elements are actually not very “rare” at all, in earth’s crust, but are usually found with many other elements. The absence or “rarity” of concentrated mineral deposits, in comparison to the more common metals, made them difficult to obtain pure in large quantities until specific mineral extraction technologies were developed. This has made the term “rare earths” less applicable in modern terms, and certainly does not accurately reflect the earth’s abundance of these elements. Nevertheless, calling the lanthanides, “rare earth” elements has persisted and the name makes the lanthanides unique among the metals on the periodic chart, a uniqueness that is actually accurate, as this book will demonstrate

This book provides a comprehensive coverage of the basic chemistry, particularly inorganic chemistry, of the Rare Earth Elements. Inclusion of Group 3 elements (Sc, Y and La) and Group 13 elements (particularly Al) demonstrates how the Lanthanides relate to transition metals and main group elements in the Periodic Table. The book begins with chapters describing the fundamentals electronic, structural, and bonding trends of the elements to provide a foundation for understanding the specific chemistry described in subsequent chapters. The bulk of the chapters are organized based on the oxidation state of the elements, and particularly, the most common trivalent state. Within this organization the chapters focus on the wide variety of lanthanide compounds that form with specific types of ligands to provide a wide range of bonding environments. The book concludes with chapters describing the wide range of solid-state materials that contain, and utilize, lanthanides, followed by chapters on important, and newly-emerging, biological applications. The arrangement and content of the chapters in the book are designed to provide a fundamental understanding of lanthanide chemistry with examples of the most recent advances in research, and the important new and future applications of the Rare Earths.

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Josephine Weeks:

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