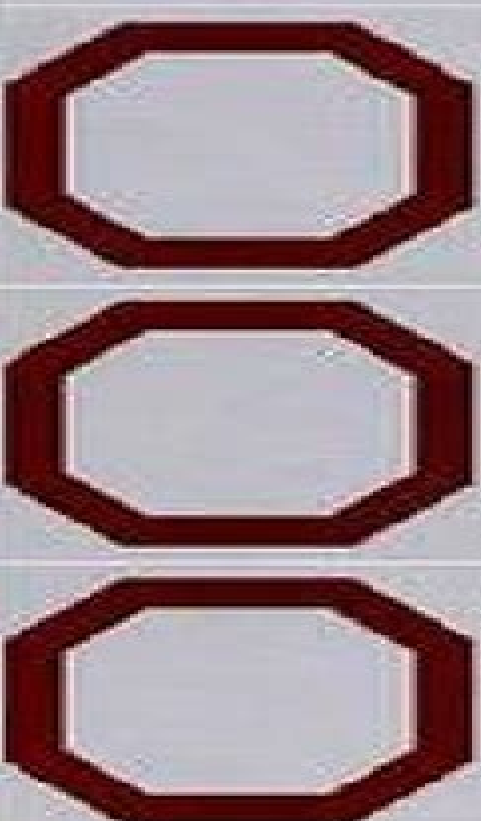




K.A. Gschneidner, Jr. and L. Eyring
Editors

HANDBOOK ON THE
PHYSICS AND CHEMISTRY OF
RARE EARTHS

Volume 28

North-Holland



Handbook Physics Chemistry Rare Earths

G Thomas



Handbook Physics Chemistry Rare Earths:

Handbook on the Physics and Chemistry of Rare Earths Karl A. Gschneidner (Jr.), L. Eyring, 2000-07-11 Even at the beginning of the new millennium the rare earths still remain to a certain extent a mystery. The chapters in this volume will help to unravel some of these. In the filling of the 4f electronic orbitals the lanthanides defy the elementary aufbau principle that underlies the periodic sequence of the elements and the authors of the first chapter introduce the readers to the basic physics of the orbital collapse leading to that failure. Furthermore an explanation is offered in terms of double well potentials. The phenomenon is illustrated using the valence transitions observed in some of the rare earth atoms including Sm group metals and the higher oxides of cerium, praseodymium and terbium. In the second chapter the synthesis and structure of the many types of rare earth halides are described. They have been described as simple, complex, binary, ternary and multinuclear, complex and other categories needed to deal with the most studied of the rare earth compounds. The structure types are skillfully illustrated to show the elementary architecture of each type. In chapter three the authors discuss the science and applications of rare earth super ionic conductors as solid electrolytes. Conduction by oxygen and fluorine anions as well as hydrogen and other cations associated with these electrolytes is emphasized. They deal with extrinsic and intrinsic types together with their associated structures and structural types including structural defects. The chapter concludes with an outline of the many applications of solid electrolytes. Chapter four introduces the reader to the principles that underlie thermoluminescence and its application to dosimetry and provides detailed information on the R-activated phosphors that support dosimetry. This is a selective review of detailed literature based on the areas making most progress. The final chapter elaborates on the data gained by the studies and interpretation around the analytical separation of the individual rare earth elements utilizing chromatographic techniques. The authors describe the fundamental chemistry that underpins contemporary analytical separation techniques for lanthanide separation and analysis. This is done after a description of the rich assortment of separation methods in use has been introduced.

Handbook on the Physics and Chemistry of Rare Earths Karl A. Gschneidner (Jr.), 1978

Handbook on the Physics and Chemistry of Rare Earths: without special title, 1986

Handbook on the Physics and Chemistry of Rare Earths, 2016-08-01

Handbook on the Physics and Chemistry of Rare Earths is a continuous series of books covering all aspects of rare earth science including chemistry, life sciences, materials science and physics. The book's main emphasis is on rare earth elements Sc, Y and the lanthanides La through Lu but whenever relevant information is also included on the closely related actinide elements. Individual chapters are comprehensive, broad, up to date, critical reviews written by highly experienced invited experts. The series which was started in 1978 by Professor Karl A. Gschneidner Jr. combines and integrates both the fundamentals and applications of these elements and publishes two volumes a year. Presents up to date overviews of new developments in the field of rare earths covering both their physics and chemistry. Contains individual chapters that are comprehensive and broad with critical

reviews Provides contributions from highly experienced invited experts **Handbook on the Physics and Chemistry of Rare Earths** ,2011-09-22 This continuing authoritative series deals with the chemistry materials science physics and technology of the rare earth elements in an integrated manner Each chapter is a comprehensive up to date critical review of a particular segment of the field The work offers the researcher and graduate student a complete and thorough coverage of this fascinating field REVIEW Highly experienced authors have written each review usually at a level suitable for advanced postgraduate students and research workers from a variety of fields With the great richness of information involving references to other review articles written from different points of view the books are an important reference source and should be on the shelves of most libraries Journal of Applied Crystallography Authoritative Comprehensive Up to date Critical

Handbook on the Physics and Chemistry of Rare Earths : Special Volumes -- Actinide and Lanthanide Elements ,1993 **Handbook on the Physics and Chemistry of Rare Earths: Metals** Karl A. Gschneidner (Jr.),LeRoy Eyring,1978 The rare earths play a unique role in science These seventeen related elements afford a panoply of subtle variations deriving from the systematic development of their electronic configurations allowing a test of theory with excellent resolution In contrast they find widespread use in even the most mundane processes such as steel making for polishing materials and gasoline cracking catalysts In between are exotic uses such as TV screen phosphors lasers high strength permanent magnets and chemical probes This multi volume handbook covers the entire rare earth field in an integrated manner Each chapter is a comprehensive up to date critical review of a particular segment of the field The work offers the researcher and graduate student alike a complete and thorough coverage of this fascinating field Handbook on the Physics and Chemistry of Rare Earths ,1978 Rare Earths Paul Caro,1998 **Handbook on the Physics and Chemistry of Rare Earths** Jean-Claude G. Bunzli,2022-07-14 Handbook on the Physics and Chemistry of Rare Earths Including Actinides Volume 61 presents the latest release in this continuous series that covers all aspects of rare earth science including chemistry life sciences materials science and physics **Handbook on the Physics and Chemistry of Rare Earths** ,2016-11-17 Handbook on the Physics and Chemistry of Rare Earths Including Actinides is a continuous series of books covering all aspects of rare earth science including chemistry life sciences materials science and physics The book's main emphasis is on rare earth elements Sc Y and the lanthanides La through Lu but whenever relevant information is also included on the closely related actinide elements Individual chapters are comprehensive broad up to date critical reviews written by highly experienced invited experts The series which was started in 1978 by Professor Karl A Gschneidner Jr combines and integrates both the fundamentals and applications of these elements with two published volumes each year Presents up to date overviews and new developments in the field of rare earths covering both their physics and chemistry Contains Individual chapters that are comprehensive and broad with critical reviews Provides contributions from highly experienced invited experts Handbook on the Physics and Chemistry of Rare Earths Jean-Claude G. Bünzli,2019

Handbook On The Physics And Chemistry Of Rare Earths Gschneidner K.A., Physical Metallurgy R.W. Cahn,P.

Haasen,1996-02-09 This is the fourth edition of a work which first appeared in 1965 The first edition had approximately one thousand pages in a single volume This latest volume has almost three thousand pages in 3 volumes which is a fair measure of the pace at which the discipline of physical metallurgy has grown in the intervening 30 years Almost all the topics previously treated are still in evidence in this version which is approximately 50% bigger than the previous edition All the chapters have been either totally rewritten by new authors or thoroughly revised and expanded either by the third edition authors alone or jointly with new co authors Three chapters on new topics have been added dealing with dry corrosion oxidation and protection of metal surfaces the dislocation theory of the mechanical behavior of intermetallic compounds and most novel a chapter on polymer science for metallurgists which analyses the conceptual mismatch between metallurgists and polymer scientists way of looking at materials Special care has been taken throughout all chapters to incorporate the latest experimental research results and theoretical insights Several thousand citations to the research and review literature are included in this edition There is a very detailed subject index as well as a comprehensive author index The original version of this book has long been regarded as the standard text in physical metallurgy and this thoroughly rewritten and updated version will retain this status

Binary Rare Earth Oxides G. Adachi,Nobuhito Imanaka,Z.C. Kang,2004-09

Binary Rare Earth Oxides is the first book in the field of rare earth oxides that provides coverage from the basic science through to recent advances This book introduces the unique characteristics of the binary rare earth oxides with their chemistry physics and applications It provides a comprehensive review of all the characteristics of rare earth oxides essential for scientists and engineers involved with rare earths oxides inorganic materials ceramics and structures The binary rare earth oxides bring us a variety of interesting characteristics Understanding their fundamental mechanisms builds a bridge between solid state chemistry and materials science The book begins with a brief introduction to binary rare earth oxides their physical and chemical stabilities polymorphism crystal structures and phase transformation and the association with current applications The book goes on to present the band structure of the oxides using several quantum chemical calculations which belong to a newly developed area in the binary rare earth oxides Central to this chapter are the characterizations of electrical magnetic and optical properties as well as details of single crystal growth and particle preparation methods that have progressed in recent years Later chapters concentrate on thermo chemical properties and trace determination techniques The final chapter contains a variety of useful applications in various fields such as phosphors glass abrasives automotive catalysts fuel cells solid electrolytes sunscreens iron steels and biological materials This book is an invaluable resource for materials scientists and solid state physicists and chemists with an interest in rare earth oxides as well as advanced students and graduates who require an approach to familiarize them with this field This book provides guidance through a comprehensive review of all the characteristics of binary rare earth oxides

Handbook on the

Physics and Chemistry of Rare Earths K.A. Gschneidner, L. Eyring, M.B. Maple, 2000-12-15 This volume of the Handbook is the first of a two volume set of reviews devoted to the rare earth based high temperature oxide superconductors commonly known as hiTC superconductors The history of hiTC superconductors is a few months short of being 14 years old when Bednorz and Müller published their results which showed that $\text{LaBa}_2\text{CuO}_4$ had a superconducting transition of 30 K which was about 7K higher than any other known superconducting material Within a year the upper temperature limit was raised to nearly 100K with the discovery of an 90K superconducting transition in $\text{YBa}_2\text{Cu}_3\text{O}_7$ The announcement of a superconductor with a transition temperature higher than the boiling point of liquid nitrogen set off a frenzy of research on trying to find other oxide hiTC superconductors Within a few months the maximum superconducting transition reached 110 K $\text{Bi}_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_{10}$ and then 122K $\text{TlBa}_2\text{Ca}_3\text{Cu}_4\text{O}_{11}$ It took several years to push TC up another 11 K to 133 K with the discovery of superconductivity in $\text{HgBa}_2\text{Ca}_2\text{Cu}_3\text{O}_8$ which is still the record holder today *Rare-Earth Elements* Henning Höpfe, 2024-03-18 When the author began working on phosphors based on rare earth elements he lacked an introductory textbook that explained the fundamental chemistry basic optical properties and magnetic characteristics of lanthanide elements This book provides a concise overview of the rare earth elements and is divided into two parts In the first part the reader receives an overview of solid state chemistry and fundamental physical properties of these elements Key topics of the first part include the separation chemistry of lanthanides their chemical behaviour and physical properties Then relevant compound classes are illustrated crystal structures are systematically explained The second part focuses on the optical and magnetic properties on relevant examples also discussing many applications Students and researchers new to the topic of Rare Earth Elements receive a comprehensive introduction to understand basic optical and magnetic properties and incentives for deeper studies

Lanthanides-Actinides K. A. Gschneidner, Jr., Karl A. Gschneidner, Leroy Eyring, G. H. Lander, Gregory R. Choppin, 1993 Hardbound This volume of the Handbook is the first of a three volume set of reviews devoted to the interrelationships similarities differences and contrasts of the lanthanide and actinide series of elements In order to comprehensively cover this large field two leading scientists G H Lander and G R Choppin were invited to be guest editors for this special set of volumes Together the four editors carefully and critically chose the various topics and invited the appropriate experts to write reviews keeping in mind that the emphasis was to be on the interrelationships of the lanthanides and actinides The volume contains eight chapters concerned with some of the physical aspects of the lanthanide and actinide series The first three chapters are theoretical in nature and the last five are more heavily oriented towards experimental studies *The Rare Earth Elements* J.H.L. Voncken, 2015-12-24 This book deals with the rare earth elements REE which are a series of 17 transition metals scandium yttrium and the lanthanide series of elements lanthanum cerium praseodymium neodymium promethium samarium europium gadolinium terbium dysprosium holmium erbium thulium ytterbium and lutetium They are relatively unknown to the wider public despite their numerous applications and their critical

role in many high tech applications such as high temperature superconductors phosphors for energy saving lamps flat screen monitors and flat screen televisions rechargeable batteries household and automotive very strong permanent magnets used for instance in wind turbines and hard disk drives or even in a medical MRI application This book describes the history of their discovery the major REE ore minerals and the major ore deposits that are presently being exploited or are planned to be exploited in the very near future the physical and chemical properties of REEs the mineral processing of REE concentrates and their extractive metallurgy the applications of these elements their economic aspects and the influential economical role of China and finally the recycling of the REE which is an emerging field *The Rare Earth Elements* David A.

Atwood, 2013-02-19 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

Handbook Physics Chemistry Rare Earths Book Review: Unveiling the Power of Words

In some sort of driven by information and connectivity, the power of words has be more evident than ever. They have the ability to inspire, provoke, and ignite change. Such may be the essence of the book **Handbook Physics Chemistry Rare Earths**, a literary masterpiece that delves deep in to the significance of words and their affect our lives. Compiled by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we shall explore the book is key themes, examine its writing style, and analyze its overall affect readers.

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