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2.4.15 Chinese Ion Adsorption Deposits 2.4.16 Dong Pao, Vietnam; 2.5 Resources in the Deep Sea; 2.5.1 Pelagic Muds; 2.5.2 Crusts on Seamounts; 2.5.3 Exploitation of Deep-Sea Deposits; References; 3 Physical and Chemical Properties of the Rare Earths; Abstract; 3.1 Introduction; 3.2 The Lanthanide Series; 3.2.1 Lanthanide Oxides; 3.2.2 Scandium and Yttrium; 3.3 The Lanthanide Contraction; 3.4 Radioactivity and Isotopes; 3.4.1 Lanthanum (Element 57); 3.4.2 Cerium (Element 58); 3.4.3 Praseodymium (Element 59); 3.4.4 Neodymium (Element 60); 3.4.5 Promethium (Element 61) 3.4.6 Samarium (Element 62) 3.4.7 Europium (Element 63); 3.4.8 Gadolinium (Element 64); 3.4.9 Terbium (Element 65); 3.4.10 Dysprosium (Element 66); 3.4.11 Holmium (Element 67); 3.4.12 Erbium (Element 68); 3.4.13 Thulium (Element 69); 3.4.14 Ytterbium (Element 70); 3.4.15 Lutetium (Element 71); 3.5 Magnetism; 3.6 Chemical Behavior; 3.6.1 Air and Oxygen; 3.6.2 Nitrogen; 3.6.3 Hydrogen; 3.6.4 Carbon; 3.6.5 Silicon; 3.6.6 Refractory Metals; 3.6.7 Acids and Bases; 3.6.8 Water; 3.7 Luminescence; References; 4 Mineral Processing and Extractive Metallurgy of the Rare Earths; Abstract; 4.1 Introduction 4.2 Mineral Processing and Extraction of Rare Earths 4.2.1 Hard Rock Deposits; 4.2.1.1 Liberation; 4.2.1.2 Mineral Separation (Flotation); 4.2.1.3 Mineral Processing at Mountain Pass, Bayan Obo, and Mount Weld; 4.2.2 Placer Deposits; 4.2.3 Chemical Treatment to Decompose the Mineral Concentrates; 4.2.3.1 Monazite; 4.2.3.2 Bastnaesite; 4.2.3.3 Chlorination; 4.2.3.4 Xenotime; 4.2.3.5 Gadolinite; 4.2.3.6 Euxenite; 4.2.3.7 Loparite, Pyrochlore, Fergusonite and Samarskite; 4.2.3.8 Apatite; 4.3 Separation Processes; 4.3.1 Selective Oxidation; 4.3.2 Selective Reduction 4.3.3 Fractional Crystallization

Sommario/riassunto

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.