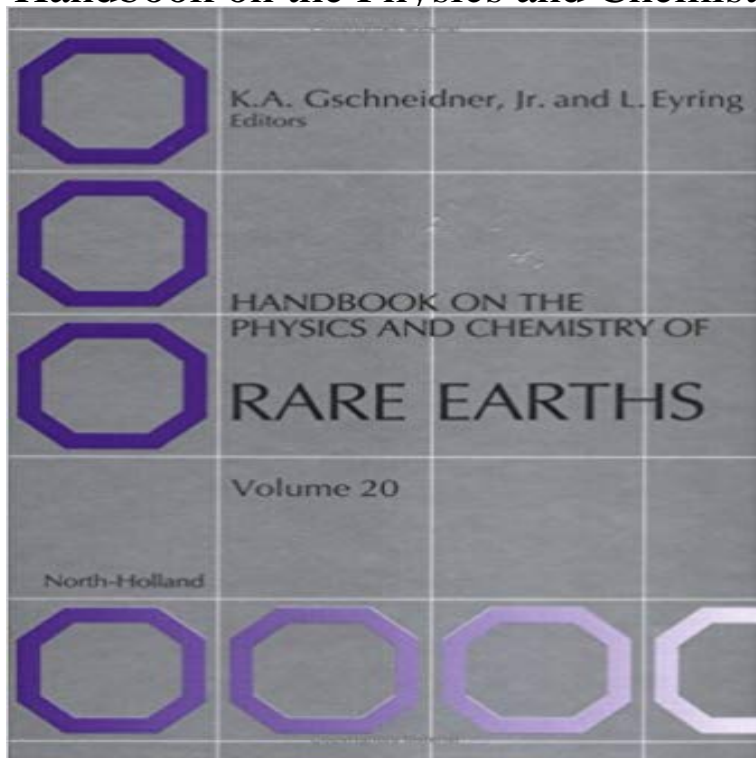


Handbook on the Physics and Chemistry of Rare Earths, Volume 20



Volume 20 completes the second decade of volumes in this series and focuses on the physical aspects of metallic compounds. Research efforts on metallic rare earth compounds started in earnest about 50 years ago and received a significant boost with the discovery of the RCo_5 permanent magnets about 12 years later. During this time much has been learned about the structure as well as the electrical, magnetic and thermal properties of approximately 2500 binary rare earth metallic compounds. However, if one considers the possible true ternary compounds and possible pseudo-binary ternary alloys formed by mixing two binary compounds, there is still a wealth of knowledge to be obtained from these still-to-be discovered materials. This volume makes a start in this direction. Chapter one deals with the Fermi surfaces of rare earth (Y, La, Ce, Pr, Nd, Sm, Gd and Yb) intermetallic compounds. It begins with an introduction to the relevant theories required to describe the electrons near the Fermi surface and then to the basic experimental techniques to study these surfaces. The main portion of the chapter is devoted to a comparison of the experimental results with the band structure calculations for a large number of compounds. Chapter two examines the world of thin films of rare earth metals, alloys and compounds. The three main topics covered are the pure metals themselves, metallic alloys and compounds, and metalloid compounds. The next chapter is devoted to hydrogen in metals and their binary compounds RH_2 and RH_3 . One of the critical problems is the purity of the starting rare earth metal itself because phase relations can be greatly affected by impurities and attention is therefore paid to the preparation of specimens and the phase diagrams. Structural properties, kinetics and thermodynamic behavior, as well as electronic, magnetic and thermal properties

are reviewed as well. Also examined is the profound influence of hydrogen on the magnetic properties by the mediation of RKKY interaction in these materials. The final chapter is an update on the magnetic behaviors of lanthanide intermetallic compounds, an area which has seen many new developments in the last 15 years. The chapter is divided into two main parts. Part one is devoted to 3d magnetism where both the 3d metal and lanthanide element contribute to the magnetic behavior, and the second part is concerned with lanthanide magnetism itself.

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