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Some Aspects of the Magnetic Properties of Rare Earth-iron Group Laves Phase Intermetallic CompoundsMagnetic Properties of Rare-earth Fluoride[3F10] StructureMagnetic Properties of Rare Earth MetalsPreparation and Magnetic Properties of Rare Earth Garnets and ApatitesMagnetic properties of rare-earth fluorides with KY3F10 structureMagnetic Properties of Rare Earth and Transition Metal MultilayersInternal Magnetic Properties in Rare Earth Metals and CompoundsInvestigations Into the Magnetic Properties of Rare Earth CompoundsMagnetic Properties of Rare Earth-Indium Compounds Structure and Magnetic Properties of Rare Earth GarnetsTransport and Magnetic Properties of Rare Earth Containing Clathrates and Clathrate Like CompoundsThe Magnetic Properties of Rare Earth Ions in GarnetsMagnetic Properties of Rare Earth Intermetallic Compounds - RCo12B6 and La1-xYxMn2Si2Magnetic Properties of rare-earth-silver-gallium CompoundsMagnetic Properties of Rare Earth Intermetallic Compounds with IronMagnetic Properties of Rare-earth Elements and SuperlatticesMagnetic Properties of Rare-earth Single CrystalsMagnetic Properties of Rare Earth MetalsMagnetic Properties of Rare Earth Iron CompoundsMagnetic Properties of Rare Earth-transition Metal Compositionally-modulated Rilm'sMagnetic properties of rare-earth nitrates with K3 R2 (NO3) structureMagnetic Properties of Rare-earth Elements and SuperlatticesMagnetic Properties of rare-earth Zirconate PyrochloresExcitations and magnetic properties of rare-earth A12 compoundsMagnetic Properties of Rare Earth Metals and AlloysMagnetic Properties of Rare Earth Metals; Edited by R.j. ElliottHandbook of Crystal Structures and Magnetic Properties of Rare Earth IntermetallicsMagnetic Properties of Rare-earth Doped YBa2Cu3O-- and YBa2Cu4OMagnetic Properties of Rare Earth-iron AlloysRare Earth MagnetismTheory of Anisotropic MagnetsExcitations and Magnetic Properties of Rare-earth A12 CompoundsElectronic Structure and Magnetic Properties of Rare Earth NitridesTheory of the Magnetic Properties of Rare Earth - Transition Metal AlloysMagnetic Properties of Rare-earth MetalsThermodynamic and Magnetic Properties of Rare-earth Compounds from Density Functional TheoryMagnetic Properties of Rare Earth Iron CompoundsMagnetic properties of rare earth superlatticesThe Structural and Magnetic Properties of Rare-earth Alloys and SuperlatticesRare Earth Materials

The aim of the authors in this monograph has not been to present a comprehensive review of the magnetic properties of rare earth metals, but rather to present a unified and coherent account of a limited but important area of rare earth magnetism, the magnetic structures and excitations, which both reflect the nature of the fundamental magnetic interactions and determine many of the characteristic properties of the metals. The authors have tried to concentrate on the essential principles and their applications to typical examples, generally restricting the discussion to the pure elements and considering alloys and compounds only when they are necessary to illuminate particular topics. Rare-earth intermetallics, also known as lanthanide elements, play an important role in the study of magnetic materials and the development of semi- and super-conducting materials. This handbook provides an up-to-date compilation of crystallographic, physical, and magnetic data on rare-earth
intermetallic compounds. Over 20 different structure types are described in detail with an emphasis on how crystal structure can affect magnetic properties. Theoretical models for magnetic interactions are described as well as the impact of crystal electric fields on transport properties, magneto crystalline anisotropy and hyperfine interactions. This book provides materials scientists, engineers and physicists with all the critical information needed to use rare-earth intermetallics effectively in the development of new materials. Susceptibility measurements in the range 20 to 1.5 K are reported for the 8 paramagnetic garnets with the composition R3X5O12, where R equals Gd(3+), Tb(3+), Ho(3+) or Tm(3+) and X equals Al(3+) or Ga(3+) together with microwave resonance determinations of the principal g-values of the ions Nd(3+), Dy(3+), Er(3+) and Yb(3+) substituted into diamagnetic Lu3Al5O12 and Lu3Ga5O12. Results are interpreted qualitatively as indicating highly anisotropic and relatively large local crystalline electric fields, and the effect of these on the properties of ferrimagnetic rare earth iron garnets is concerned. In the ferrimagnetic garnets, the rare earth ions will almost always divide into 6 non-collinear sublattices, whose magnetic moments make quite large angles with the 2 antiparallel Fe sublattices. For YbIG, it was possible to make a numerical estimate of the angles of canting. (Author). The first objective of this study was to build and calibrate an apparatus for measuring magnetic properties of small ferromagnetic rod samples. The second was to measure the magnetic properties of five rare earth-iron alloys. Magnetic properties of neodymium-iron, praseodymium iron, and cerium-iron alloys were measured on small rod samples. Constant temperature plots of magnetization versus field (up to 24 kOe) as well as constant field plots of magnetization versus temperature (4.2K to 375K) were obtained for the samples. The apparatus provided an accurate and rapid means of obtaining magnetic data. The magnetization value obtained for a pure nickel sample was within 0.5% of published data. The 24 kOe field was not sufficient to reach the saturation magnetization of the rare earth alloys. The values of Curie temperature could not be obtained by extrapolating the spontaneous magnetization curve to the temperature axis. The rare earths have a unique place among the elements. Although very much alike chemically and in most physical properties they each have very different and striking magnetic properties. The reason, of course, lies in their 4f electrons which determine the magnetic properties but have little effect on other chemical and physical behaviour. Although they are not rare, some indeed are among the more common heavy elements in the earth's crust, the difficulty of separation has meant that their intricate magnetic properties have only recently been unravelled. Now, however, the general pattern of their magnetism is well charted and the underlying theory is well understood. Both are thoroughly summarised in this book. It provides an excellent example of the kind of extensive synthesis which is possible with modern solid state physics. It represents only a high plateau in the ascent to complete understanding. But it will become clear to the reader that while the overall position is satisfactory there are many details still to be elucidated experimentally and much to be done theoretically before all the underlying forces are identified and estimated from a priori calculations. It is hoped that the book will provide a useful stimulus in this direction. It should also be of use to those who are interested in related disciplines, for example the rare earth compounds, or the transition metals. In addition rare earths promise to be important technologically as alloy constituents. Recent studies indicate that China accounts for about 96 percent of the world's supply of rare earth materials (REMs). With
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REMs becoming increasingly important for a growing number of high-tech applications, appropriate action must be taken to mitigate the effects of a shortage of critical REMs in defense systems and components. Bringing together information previously available only from disparate journal articles and databases, Rare Earth Materials: Properties and Applications describes the unique characteristics and applications of 17 REMs. It defines their chemical, electrical, thermal, and optical characteristics. Maintaining a focus on physical and chemical properties, it addresses the history and critical issues pertaining to mining and processing of REMs. In this book, Dr. A.R. Jha continues his distinguished track record of distilling complex theoretical physical concepts into an understandable technical framework that can be extended to practical applications across commercial and industrial frameworks. He summarizes the chemical, optical, electrical, thermal, magnetic, and spectroscopic properties of REMs best suited for next-generation commercial and military systems or equipment. Coverage includes extraction, recycling, refinement, visual inspection, identification of spectroscopic parameters, quality control, element separation based on specific application, pricing control, and environmental / geo-political considerations. Potential applications are identified with an emphasis on scientific instruments, nuclear resonance imaging equipment, MRI systems, magnetic couplers for uranium enrichment equipment, battery-electrodes, electric motors, electric generators, underwater sensors, and commercial and military sensors. The book describes unique applications of rare earth magnets in all-electric and hybrid electric cars and microwave components. It also considers the use of rare earth magnets in commercial and military systems where weight and size are the critical design requirements. Suitable for both students and design engineers involved in the development of high-technology components or systems, the book concludes by summarizing future applications in electro-optic systems and components, including infrared lasers, diode-pumped solid-state lasers operating at room temperatures, and other sophisticated military and commercial test equipment.

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