

1. Record Nr.	UNINA9910145959403321
Autore	Cullity B. D. (Bernard Dennis)
Titolo	Introduction to magnetic materials / / B.D. Cullity, C.D. Graham
Pubbl/distr/stampa	Hoboken, New Jersey : , : IEEE/Wiley, , c2009 [Piscataqay, New Jersey] : , : IEEE Xplore, , [2008]
ISBN	0-470-65344-2 1-118-21149-9 1-282-13693-3 9786612136931 0-470-38632-0 0-470-38631-2
Edizione	[2nd ed.]
Descrizione fisica	1 online resource (564 p.)
Altri autori (Persone)	GrahamC. D (Chad D.)
Disciplina	538.4 538/.4
Soggetti	Magnetism Magnetic materials
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Includes index.
Nota di contenuto	Preface to the First Edition -- Preface to the Second Edition -- 1. Definitions and Units -- 1.1 Introduction -- 1.2 The cgs-emu System of Units -- 1.3 Magnetic Moment -- 1.4 Intensity of Magnetization -- 1.5 Magnetic Dipoles -- 1.6 Magnetic Effects of Currents -- 1.7 Magnetic Materials -- 1.8 SI Units -- 1.9 Magnetization Curves and Hysteresis Loops -- 2. Experimental Methods -- 2.1 Introduction -- 2.2 Field Production By Solenoids -- 2.3 Field Production by Electromagnets -- 2.4 Field Production by Permanent Magnets -- 2.5 Measurement of Field Strength -- 2.6 Magnetic Measurements in Closed Circuits -- 2.7 Demagnetizing Fields -- 2.8 Magnetic Shielding -- 2.9 Demagnetizing Factors -- 2.10 Magnetic Measurements in Open Circuits -- 2.11 Instruments for Measuring Magnetization -- 2.12 Magnetic Circuits and Permeameters -- 2.13 Susceptibility Measurements -- Problems -- 3. Diamagnetism and Paramagnetism -- 3.1 Introduction -- 3.2 Magnetic Moments of Electrons -- 3.3 Magnetic

Moments of Atoms -- 3.4 Theory of Diamagnetism -- 3.5
Diamagnetic Substances -- 3.6 Classical Theory of Paramagnetism --
3.7 Quantum Theory of Paramagnetism -- 3.8 Paramagnetic
Substances -- Problems -- 4. Ferromagnetism -- 4.1 Introduction --
4.2 Molecular Field Theory -- 4.3 Exchange Forces -- 4.4 Band Theory
-- 4.5 Ferromagnetic Alloys -- 4.6 Thermal Effects -- 4.7 Theories of
Ferromagnetism -- 4.8 Magnetic Analysis -- Problems -- 5.
Antiferromagnetism -- 5.1 Introduction -- 5.2 Molecular Field Theory
-- 5.3 Neutron Diffraction -- 5.4 Rare Earths -- 5.5 Antiferromagnetic
Alloys -- Problems -- 6. Ferrimagnetism -- 6.1 Introduction -- 6.2
Structure of Cubic Ferrites -- 6.3 Saturation Magnetization -- 6.4
Molecular Field Theory -- 6.5 Hexagonal Ferrites -- 6.6 Other
Ferrimagnetic Substances -- 6.7 Summary: Kinds of Magnetism --
Problems -- 7. Magnetic Anisotropy -- 7.1 Introduction -- 7.2
Anisotropy in Cubic Crystals -- 7.3 Anisotropy in Hexagonal Crystals
-- 7.4 Physical Origin of Crystal Anisotropy.
7.5 Anisotropy Measurement -- 7.6 Anisotropy Measurement (from
Magnetization Curves) -- 7.7 Anisotropy Constants -- 7.8
Polycrystalline materials -- 7.9 Anisotropy in Antiferromagnetics --
7.10 Shape Anisotropy -- 7.11 Mixed Anisotropies. -- Problems -- 8.
Magnetostriction and the Effects of Stress -- 8.1 Introduction -- 8.2
Magnetostriction of Single Crystals -- 8.3 Magnetostriction of
Polycrystals -- 8.4 Physical Origin of Magnetostriction -- 8.5 Effect of
Stress on Magnetic Properties -- 8.6 Effect of Stress on
Magnetostriction -- 8.7 Applications of Magnetostriction -- 8.8 E Effect
-- 8.9 Magnetoresistance -- Problems -- 9. Domains and the
Magnetization Process -- 9.1 Introduction -- 9.2 Domain Wall
Structure -- 9.3 Domain Wall Observation -- 9.4 Magnetostatic Energy
and Domain Structure -- 9.5 Single-Domain Particles -- 9.6
Micromagnetics -- 9.7 Domain Wall Motion -- 9.8 Hindrances to Wall
Motion (Inclusions) -- 9.9 Residual Stress -- 9.10 Hindrances to Wall
Motion (Microstress) -- 9.11 Hindrances to Wall Motion (General) --
9.12 Magnetization by Rotation -- 9.13 Magnetization in Low Fields --
9.14 Magnetization in High Fields -- 9.15 Shapes of Hysteresis Loops
-- 9.16 Effect of Plastic Deformation (Cold Work) -- Problems -- 10.
Induced Magnetic Anisotropy -- 10.1 Introduction -- 10.2 Magnetic
Annealing (Substitutional Solid Solutions) -- 10.3 Magnetic Annealing
(Interstitial Solid Solutions) -- 10.4 Stress Annealing -- 10.5 Plastic
Deformation (Alloys) -- 10.6 Plastic Deformation (Pure Metals) -- 10.7
Magnetic Irradiation -- 10.8 Summary of Anisotropies -- 11. Fine
Particles and Thin Films -- 11.1 Introduction -- 11.2 Single-Domain vs
Multi-Domain Behavior -- 11.3 Coercivity of Fine Particles -- 11.4
Magnetization Reversal by Spin Rotation -- 11.5 Magnetization
Reversal by Wall Motion -- 11.6 Superparamagnetism in Fine particles
-- 11.7 Superparamagnetism in Alloys -- 11.8 Exchange Anisotropy --
11.9 Preparation and Structure of Thin Films -- 11.10 Induced
Anisotropy in Films.
11.11 Domain Walls in Films -- 11.12 Domains in Films -- Problems --
12. Magnetization Dynamics -- 12.1 Introduction -- 12.2 Eddy
Currents -- 12.3 Domain Wall Velocity -- 12.4 Switching in Thin Films
-- 12.5 Time Effects -- 12.6 Magnetic Damping -- 12.7 Magnetic
Resonance -- Problems -- 13. Soft Magnetic Materials -- 13.1
Introduction -- 13.2 Eddy Currents -- 13.3 Losses in Electrical
Machines -- 13.4 Electrical Steel -- 13.5 Special Alloys -- 13.6 Soft
Ferrites -- Problems -- 14. Hard Magnetic Materials -- 14.1
Introduction -- 14.2 Operation of Permanent Magnets -- 14.3 Magnet
Steels -- 14.4 Alnico -- 14.5 Barium and Strontium Ferrite -- 14.6 Rare
Earth Magnets -- 14.7 Exchange-Spring Magnets -- 14.8 Nitride

Magnets -- 14.9 Ductile Permanent Magnets -- 14.10 Artificial Single Domain Particle -- 14.11 Bonded Magnets -- 14.12 Magnet Stability -- 14.13 Summary of Magnetically Hard Materials -- 14.14 Applications -- Problems -- 15. Magnetic Materials for Recording and Computers -- 15.1 Introduction -- 15.2 Magnetic Recording -- 15.3 Principles of Magnetic Recording -- 15.4 Magnetic Digital Recording -- 15.5 Perpendicular Recording -- 15.6 Possible Future Developments -- 15.7 Magneto-Optic Recording -- 15.8 Magnetic Memory -- 16. Magnetic Properties of Superconductors -- 16.1 Introduction -- 16.2 Type I Superconductors -- 16.3 Type II Superconductors -- 16.4 Susceptibility Measurements -- 16.5 Demagnetizing Effects -- Appendix 1. Dipole Fields and Energies -- Appendix 2. Data on Ferromagnetic Elements -- Appendix 3. Conversion of Units -- Appendix 4. Physical Constants -- Index.

Sommario/riassunto

Introduction to Magnetic Materials, 2nd Edition covers the basics of magnetic quantities, magnetic devices, and materials used in practice. While retaining much of the original, this revision now covers SQUID and alternating gradient magnetometers, magnetic force microscope, Kerr effect, amorphous alloys, rare-earth magnets, SI Units alongside cgs units, and other up-to-date topics. In addition, the authors have added an entirely new chapter on information materials. The text presents materials at the practical rather than theoretical level, allowing for a physical, quantitative, measurement-based understanding of magnetism among readers, be they professional engineers or graduate-level students.
