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Handbook of Spin Transport and Magnetism

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A Definitive Account of the Spintronics Field

In the past several decades, the research on spin transport and magnetism has led to remarkable scientific and technological breakthroughs, including Albert Fert and Peter Grünberg's Nobel Prize-winning discovery of giant magnetoresistance (GMR) in magnetic metallic multilayers. **Handbook of Spin Transport and Magnetism** provides a comprehensive, balanced account of the state of the art in the field known as spin electronics or spintronics. It reveals how key phenomena first discovered in one class of materials, such as spin injection in metals, have been revisited decades later in other materials systems, including silicon, organic semiconductors, carbon nanotubes, graphene, and carefully engineered nanostructures.

The first section of the book offers a historical and personal perspective of the field written by Nobel Prize laureate Albert Fert. The second section addresses physical phenomena, such as GMR, in hybrid structures of ferromagnetic and normal metals. The third section discusses recent developments in spin-dependent tunneling, including magnetic tunnel junctions with ferroelectric barriers. In the fourth section, the contributors look at how to control spin and magnetism in semiconductors. In the fifth section, they examine phenomena typically found in nanostructures made from metals, superconductors, molecular magnets, carbon nanotubes, quantum dots, and graphene. The final section covers novel spin-based applications, including advanced magnetic sensors, nonvolatile magnetoresistive random access memory, and semiconductor spin-lasers.

The techniques and materials of spintronics have rapidly evolved in recent years, leading to vast improvements in hard drive storage and magnetic sensing. With extensive cross-references between chapters, this seminal handbook provides a complete guide to spin transport and magnetism across a various classes of materials and structures.

FEATURES

- Offers a balanced and thorough treatment of the core principles, fundamental properties, theoretical models, experimental approaches, and state-of-the-art applications of spin transport and magnetism
- Includes a chapter by the co-recipient of the 2007 Nobel Prize in Physics
- Discusses diverse physical phenomena discovered in hybrid structures of ferromagnetic and normal metals
- Describes impressive breakthroughs in spin-dependent tunneling, including magnetic tunnel junctions with ferroelectric barriers
- Reviews the challenges and opportunities for controlling spin and magnetism in semiconductors
- Explores the phenomena characteristic of nanostructures made from a wide range of materials, including metals, superconductors, molecular magnets, carbon nanotubes, quantum dots, and graphene
- Addresses existing and potential spin-based applications

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