Nanoscale Physics for Materials Science

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Although there are many books available on the preparation, properties, and characterization of nanomaterials, few provide an interdisciplinary account of the physical phenomena that govern the novel properties of nanomaterials. Addressing this shortfall, **Nanoscale Physics for Materials Science** covers fundamental cross-disciplinary concepts in materials science and engineering. It presents a comprehensive description of the physical phenomena and changes that can be expected when macroscopically sized materials are reduced to the nanometer level.

The text is divided according to physical phenomena and interactions. After reviewing the necessary theoretical background, the authors address the electrical, optical, and magnetic properties as functions of size and distance. They discuss the energy spectrum, the charging effect, tunneling phenomena, electronically induced stable nanostructures, absorption and scattering, electromagnetic interactions, magnetism, ferromagnetic domain-wall-related phenomena, and spin transport in magnetic nanostructures. Problem sets are included at the end of each chapter.

Providing an excellent treatment of physical phenomena not covered in similar books, this text explores the electrical, optical, and magnetic properties of materials at the nanoscale level. It delves into the dramatic physical changes that occur on scales where the quantum nature of objects starts dominating their properties.

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