Symmetry, Group Theory, and the Physical Properties of Crystals [

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Physics | Chemistry, Physical organic | Optical materials | Physics | Solid State Physics | Optical and Electronic Materials | Physical Chemistry | Condensed Matter Physics

Monografía

This book demonstrates the importance of symmetry in determining the properties of solids and the power of using group theory and tensor algebra to elucidate these properties. It provides the fundamentals necessary for the reader to understand how to utilize these techniques in many different applications without becoming lost in a heavy formal treatment of the subject matter. The book begins by discussing the concepts of symmetry relevant to crystal structures. This is followed by a summary of the basics of group theory and how it applies to quantum mechanics. Next is a discussion of the description of the macroscopic properties of crystals by tensors and how symmetry determines the form of these tensors. The basic concepts covered in these early chapters are then applied to a series of different examples including crystal field theory treatment of point defects in solids, molecular orbitals, two-photon processes, the optical properties of solids, the nonlinear optical properties of solids, lattice vibrations, the Jahn-Teller effect, and the effects of translational symmetry on electronic energy bands in solids.. Emphasis is placed on showing how group theory and tensor algebra can provide important information about the properties of a system without resorting to first principal quantum mechanical calculations. The book also features a comprehensive set of relevant tables, including crystal symmetries, point group character tables, matter tensors of different rank, and other tensor properties. Key Features: (QA(BServes as a textbook or reference book for solid-state physics, solid-state chemistry, and materials science and engineering (QA(BShows how the physical properties of solids are determined by their symmetry (QA (BDemonstrates the applications of group theory (QA(BUtilizes the concept of matter tensors (QA(BIncludes an extensive set of reference tables and end of chapter problems

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