

Electrons and Phonons in Layered Crystal Structures



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ELECTRONS AND PHONONS IN LAYERED CRYSTAL STRUCTURES



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Book Condition: New. Publisher/Verlag: Springer Netherlands | This volume is devoted to the electron and phonon energy states of inorganic layered crystals. The distinctive feature of these low-dimensional materials is their easy mechanical cleavage along planes parallel to the layers. This feature implies that the chemical binding within each layer is much stronger than the binding between layers and that some, but not necessarily all, physical properties of layered crystals have two-dimensional character. In Wyckoff's Crystal Structures, SiC and related compounds are regarded as layered structures, because their atomic layers are alternately stacked according to the requirements of cubic and hexagonal close-packing. However, the uniform (tetrahedral) coordination of the atoms in these compounds excludes the kind of structural anisotropy that is fundamental to the materials discussed in this volume. An individual layer of a layered crystal may be composed of either a single sheet of atoms, as in graphite, or a set of up to five atomic sheets, as in Bi₂Te₃. A layer may also have more complicated arrangements of the atoms, as we find for example in Sb₂S₃. But the unique feature common to all these materials is the structural anisotropy, which directly affects their electronic and vibrational properties. The nature of the weak interlayer coupling is not very well understood, despite the frequent attribution of the coupling in the literature to van der Waals forces. Two main facts, however, have emerged from all studies. | I: Electrons.- A Symmetry Considerations.- 1. Group Theoretical Basis.- 1.1. Symmetry of the Schrödinger Equation.- 1.2. Group Representations.- 1.3. Crystal Point and Space Groups.- 1.3.1. Symmorphic Space Groups.- 1.3.2. The Symmorphic Crystal Space Group D_{3d}3.- 1.3.3. Non-Symmorphic Space Groups.- 1.3.4. The Non-Symmorphic Space Group D_{6h}4.- 1.4. Double Groups and Time Reversal Symmetry.- 2. Symmetrized Basis...



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