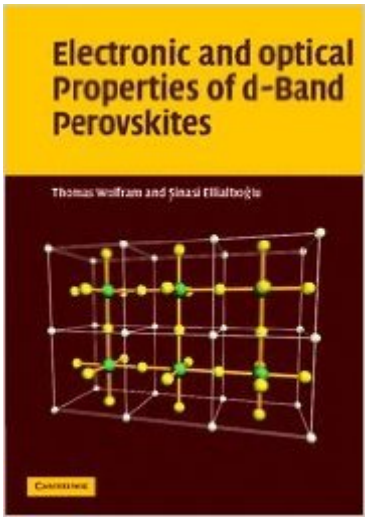
Electronic And Optical Properties Of D-Band Perovskites



Synopsis

The perovskite family of oxides includes a vast array of insulators, metals, and semiconductors. Current intense scientific interest stems from the large number of diverse phenomena exhibited by these materials including pseudo two-dimensional electronic energy bands, high temperature superconductivity, metal-insulator transitions, piezoelectricity, magnetism, photochromic, and catalytic activity. This book is the first text devoted to a comprehensive theory of the solid-state properties of these fascinating materials. The text includes complete descriptions of the important energy bands, photoemission, surface states, and the chapter on high-temperature superconductors explores the electronic states in typical copper-oxide materials. Theoretical results are compared to experiment and discussed throughout the book. With problem sets included, this is a unified, logical treatment of fundamental perovskite solid-state chemistry which will appeal to graduate students and researchers alike.

Book Information

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Customer Reviews

This is a great book. It is mainly about teaching the basic physics of transition metal oxides that are perovskites, but much of applies to "nearby" materials as well. It is quite introductory in level and methods but covers a lot of great physics. Just reading the first chapter you learn so much new physics about oxide materials and their electronic states (a minimal reading). The next few chapters show the band structure of oxides including crystal field and covalency effects, why the bands look the way they do and how to figure out what they look like, which tight-binding hopping parameters

are more important and which ones secondary (and why), and so forth. Then there is much additional material on surfaces, basics of octahedral distortions, etc. Highly recommended.My only minor criticism is that the middle part of the book spend a good deal of space computing spectral functions within very simplified approximations (densities of states or optical spectra) in order to get analytical expressions. This is nice but not as useful since one can just compute these things (within the single-particle approximation used) to high accuracy with a modern laptop computer and publicly available first principles codes in a jiffy. They do give some idea of what main features of the spectra come from in a simplified view, but maybe spending more time on the actual spectra would have been more useful. But still good stuff.Buy it! I recommend all my students, postdocs, and collaborators to read at least the first half as a good "boot camp" approach so we an all speak the same language in a short time.

A magnificent text - very readable and yet presenting the mathematical formulations throughout the book. A well balanced appproach, developing the topic in an appealing didactic style, showing how the perovskites demand a unique combination of LCAO and band theory to explain the interesting array of properties. The quantitative calculation of photoemission spectra is very gratifying, as are the accounts of the magnetic, conduction and high temperature superconductive properties. A fascinating and very educational book!Arthur T. Howe Ph.D.

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