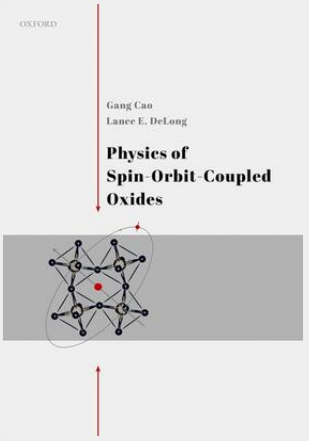
Cao / DeLong

Physics of Spin-Orbit-Coupled Oxides

This book is aimed at graduate students, post docs and senior researchers with preliminary expertise in materials physics or chemistry, and with an interest in the physical and chemical properties of 4d- and 5d transition metal oxides, especially ruthenates and iridates. The 4d- and 5d-transition metal oxides are among the most current and interesting quantum materials. This book reviews recent experimental and theoretical evidence that the physical and structural properties of these materials are decisively influenced by strong spin-orbit interactions that compete with comparable Coulomb, magnetic exchange and crystalline electric field interactions. This competition often leads to unusual ground states and magnetic frustration that are unique to this class of materials. Novel coupling between the orbital/lattice and spin degrees of freedom, which seriously challenge current theoretical models and are not addressed by traditional textbooks, are of particular interest, This book also reviews a few techniques for single-crystal growth that are most suitable for the 4d- and 5d-transition metal oxides. The discussion is intended to help fill an existing void in the literature describing relevant synthesis techniques for 4d- and 5d-materials, which is a daunting experimental challenge.



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