

BOOK REVIEW

Structural Phase Transitions in Layered Transition Metal Compounds (Physics and Chemistry of Materials with Low Dimensional Structures, Series A: Layered Structures). Edited by K. MOTIZUKI. Reidel (Kulwer), Dordrecht, 1986. ix + 300 pp., \$94.50.

Layered transition-metal dichalcogenides have been a subject of intense experimental and theoretical studies largely because of their phase transitions associated with a charge density wave (CDW). A proper understanding of the CDW phenomena in these compounds requires knowledge of their band electronic structures, lattice vibrational structures, and electron-lattice interactions. Largely, it has been the development of microscopic theories on CDW phase transitions that has helped to expand the field of research on the chemistry and physics of layered transition-metal compounds. This excellent book consists of four review articles on recent theoretical and experimental developments on layered CDW materials. The first chapter by K. Motizuki and N. Suzuki presents a microscopic theory of CDW phase transitions in meticulous detail and then provides a unified description of lattice instability and dynamics. This chapter constitutes almost half of the book. The second chapter, by N. Suzuki and K. Motizuki, goes beyond the harmonic approximation of lattice dynamics given in the first chapter and incorporates the effect of mode-

mode coupling brought about by lattice anharmonicity into a microscopic theory of CDW phase transitions. On the basis of the phenomenological Landau theory, in the third chapter H. Shiba and K. Nakanishi discuss successive CDW phase transitions of layered dichalcogenides, for which no realistic microscopic theory has yet been developed. In the last chapter, F. C. Brown briefly summarizes recent experimental developments.

The first three chapters, which are the backbone of this book, provide a detailed and rigorous theoretical foundation for CDW phase transitions. Undoubtedly, the theoretical methods described in these chapters will be of use in developing similar theories for other CDW materials. Overall, on the subject of CDW phase transitions in layered CDW materials, this book provides a timely and well-balanced theoretical treatment and will become an invaluable reference. Unfortunately, the highly mathematical descriptions in this fine book will limit its impact and its price seems appropriate for major libraries, not for personal reference for solid state chemists.

M.-H. WHANGBO

*Department of Chemistry
North Carolina State University
Raleigh, North Carolina 27695*