

Contents

Dielectric Properties and Soft Modes in Semiconducting (Pb, Sn, Ge)Te

By W. Jantsch (With 25 Figures)

1. Introduction	1
2. Experimental Determination of the Soft-Mode Frequency	5
2.1 Neutron Scattering	5
2.2 Inelastic Tunneling of Electrons	7
2.3 Raman Scattering	7
2.4 Far-Infrared Spectroscopy	11
3. Experimental Determination of the Static Dielectric Constant	20
3.1 Differential Capacitance Measurements	20
3.1 Microwave Techniques	25
4. Effects Related to the Phase Transition	29
4.1 Changes of Band Structure and Related Phenomena	29
4.2 Resistance Anomaly	30
4.3 Acoustic and Specific-Heat Anomalies	31
5. Results and Discussion	32
5.1 Temperature Dependence of the Soft Mode and Phase Transition	32
5.2 Microscopic Origin of Structural Instability and Chemical Trends of Critical Temperature	36
5.3 Influence of Lattice Defects	39
5.4 Influence of Magnetic Fields	44
6. Summary	45
References	46
Combined Subject Index	99

Electronic and Dynamical Properties of IV–VI Compounds

By A. Bussmann-Holder, H. Bilz, and P. Vogl (With 22 Figures)

1. Introduction	51
1.1 History	51
1.2 Landau Theory	53
2. Chemical Structure and Electronic Bands of IV–VI Compounds	54
2.1 Structure and Ferroelectricity	54
2.2 Ionicity and Covalency	56
2.3 Electronic Band Structure	57
2.4 The Zero-Gap Situation	59
3. Lattice Dynamics and Phase Transitions	60
3.1 General Aspects: The Soft-Mode Concept	60
3.2 Electronic Theory of the Soft-Mode Instability	61
3.3 The Anharmonic Lattice Model	65
3.3.1 Quasi-Harmonic Approximation	65
3.3.2 The Molecular-Field Treatment of a Single Mode Model	68
3.4 The Vibronic Model	71
3.5 The Polarizability Model	74
3.5.1 Results	81
3.5.2 Three-Dimensional Models	85
3.6 Comparison of Models	87
3.7 Nonlinear Excitations in IV–VI Semiconductors	88
4. Summary and Conclusion	93
References	94
Combined Subject Index	99

