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Phase Transitions and Mechanical Properties of Ternary Chalcogenides

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In the present work the mechanical properties of mercury semiconductors in the vicinity of the phase transitions were studied. Under the high hydrostatic pressure treatment the macroscopic bending of samples was observed, that gave the evidence of high plasticity of these materials near the phase transition point. The influences of chemical substitutions in cation and anion sublattices on the properties of ternary chalcogenides were analysed.The results obtained are: observation of macroscopic bending and plastic deformation of the samples undergone a high hydrostatic pressure treatment above the phase transition point Pt, microhardness dependencies on content of substitution atoms x, irreversible arising of H(x) after reversible phase transition sphalerite (B3) – cinnabar (B9) controlled by resistivity measurements. The dependencies of Pt (x) and H(x) obtained were explained quantitatively by modern theoretical approaches taking into account the recent neutron and synchrotron data of lattice transformation under variation of x and P. A correlation between electronic and mechanical properties of ternary chalcogenides near the phase transition point has been revealed. High plasticity has been established of materials in the vicinity of phase transition under pressure. The mechanism of phase transitions from tetrahedral bonded to octahedral bonded lattice at Hg, Cd and Zn chalcogenides seems to be similar, so the behaviour of mechanical properties at phase transition may be the same for this family of ternary semiconductors.

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