CdSb under Pressure: Compound Decomposition, New Phase Formation and Amorphization

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Application of high pressure offers wide possibilities to produce new materials in crystalline and amorphous states. The Cd-Sb alloy system has at ambient pressure one intermediate compound of equiatomic composition, CdSb, orthorhombic, space group *Pbca*, with 16 atoms in the unit cell. On pressure increase to 7.3 GPa, we observed a transition from CdSb-*oP*16 phase to a new state that is interpreted as a two-phase mixture of a simple hexagonal Sb-rich phase and a hexagonal close packed phase of (almost pure) Cd. At 8.4 GPa, lattice parameters are for the *sh* phase (space group *P*6/*mmm*) a = 3.066(1) Å and c = 2.860(1) Å, and for Cd-*hcp* phase (space group $P6_3/mmc$) a = 2.93(1) Å and c = 5.165(1) Å, close to those reported for pure Cd at this pressure. On pressure decrease, the two phase mixture state is observed down to 1 GPa and below 1 GPa, an amorphous phase is observed. The halos of the amorphous phase of CdSb sample correspond to Q_1=2.004 Å^{-1} and Q_2=2.953 Å^{-1}. The full width at half maximum of the halos corresponds to the correlation length 12-15 Å. The amorphous phases formed in binary alloys Zn-Sb, Cd-Sb and Al-Ge after pressure action are close to tetrahedral nets and correspond to nearly 4 el./atom composition [1,2].

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