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High Pressure Studies of Mixed Valence
Compounds of Antimony*

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Abstract

In Cs_2SbCl_6 and related compounds antimony appears as Sb(III) and Sb(V) in alternate halide octahedra. The optical spectrum contains "mixed valence" peaks assigned to Sb(III) $\rightarrow$ Sb(V) transfer near 18 and 27 kK. In addition there is a peak near 31 kK assigned to an internal transition on Sb(III) and one near 37 kK assigned to Sb(V), mixed with the absorption edge of the crystal. The mixed valence peaks shift strongly to lower energy with pressure (~ 5 kK in 120 kilobars), and decrease rapidly in integrated intensity, as does the Sb(III) peak near 31 kK. A new peak appears near 33-34 kK, tentatively assigned to Sb(IV). The ground state apparently transforms from Sb(III)-Sb(V) to Sb(IV)-Sb(IV) at high pressure. Similar behavior is observed for $\text{Cs}_2\text{Sb}_{0.3}\text{Sn}_{0.7}\text{Cl}_6$ and $(\text{CH}_3\text{CH}_2\text{NH}_3)_2\text{Sb}_{0.5}\text{Sn}_{0.5}\text{Cl}_6$.

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