Rare-Earth Antimony Suboxides as Novel Thermoelectric Materials

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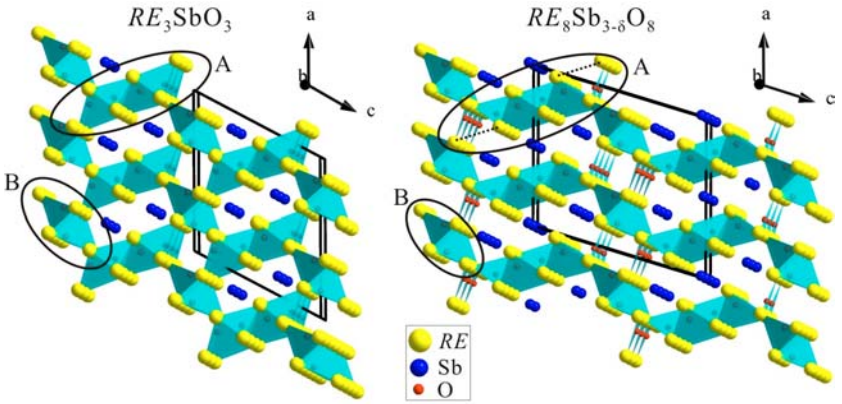
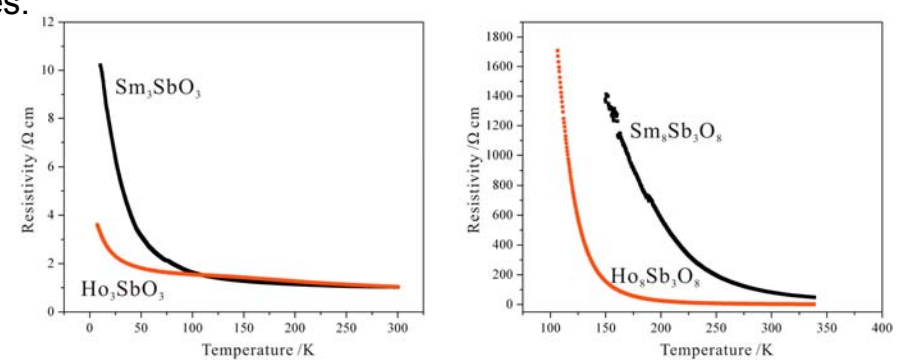
1) *RE_3SbO_3 and $RE_8Sb_{3-\delta}O_8$ antimonide oxides (RE is a rare-earth element)*

Two families of novel narrow band-gap semiconducting suboxides with the RE_3SbO_3 and $RE_8Sb_{3-\delta}O_8$ compositions (*RE* = La, Sm, Gd, Ho) have been discovered. Their synthesis was motivated by attempts to open a band gap in the semimetallic *RE*Sb binaries through a chemical fusion of *RE*Sb and corresponding insulating RE_2O_3. This strategy worked for both families of phases as the band gap opened between the valence band dominated by the Sb states and the conduction band composed primarily of the *RE* states.



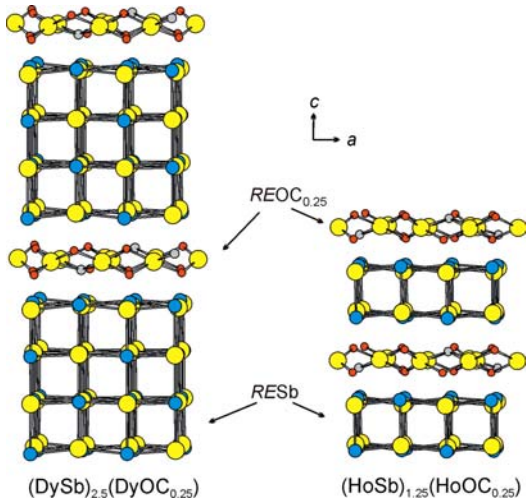
RE_3SbO_3 and $RE_8Sb_{3-\delta}O_8$ contain similar *A* and *B* blocks



RE_3SbO_3 and $RE_8Sb_{3-\delta}O_8$ are semiconducting

2) *Layred $(RESb)_n(REOC_{0.25})$ antimonide oxycarbides*

Layered oxycarbides $(HoSb)_{1.25}(HoOC_{0.25})$ and $(DySb)_{2.5}(DyOC_{0.25})$ consist of two and four layers of HoSb and DySb and one layer of $HoOC_{0.25}$ and $DyOC_{0.25}$, respectively, stacked along the *z* direction. To our knowledge, such composite structures are unique.



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