

CHARGE DENSITY WAVES IN EUROPIUM CHALCOANTIMONATES,

EuSbQ₃ (Q = Se, Te)

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Charge density waves are of interest due to their competition with other broken symmetry ground states (i.e. superconductivity)¹ and their possible applications in field effect transistors, thermoelectric materials, and high density memories.

We present two novel charge density wave compounds, EuSbSe₃ and EuSbTe₃. EuSbSe₃ crystallizes in a two-dimensional structure composed of (SbSe₂)⁻ layers surrounding a flat (Se₂)²⁻ layer. Eu is located between these layers in monocapped square antiprismatic sites. Sb possesses a square pyramidal coordination to produce the (SbSe₂)⁻ layer, and adjacent layers are separated due to the lone pairs of the Sb atoms. EuSbTe₃ crystallizes with a related structure with similar structural motifs. However, Sb possesses a distorted octahedral geometry and connects the two (SbTe₂)⁻ layers to produce a three dimensional framework. Both these compounds are interesting in that they possess a crystalline phase transition at low temperature as a result of the strong modulation due to the presence of a charge density wave.

These compounds possess chalcogenide square nets, which have been of particular interest due to their interesting properties and their ability to form superstructures via charge density wave. As each Q-Q bond would need to be elongated in order to maintain an ideal square net, valence electrons delocalize, shortening the Q-Q bonds to form a variety of oligomers. This process opens a gap at the Fermi level to produce interesting properties. This poster presents the synthesis, structures and properties of these compounds.

1. G. Gruner. Reviews of Modern Physics 60, 1129 (1988)