# Phase transitions and transport properties of complex copper chalcogenides

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We have studied the properties of a class of complex copper chalcogenides A-Cu-X (where A = alkali metal or alkaline earth metal and X = S, Se, Te), synthesized recently. In this contribution we have focused on the phase transitions and transport characteristics of this family of compounds. Very interesting and noticeable features such as: phase transitions connected with CDW formation in $K_3Cu_8S_6$, $Rb_3Cu_8S_6$, and $K_3Cu_8Se_6$, the unusual linear in T behaviour of metallic resistivity down to $T \ll \Theta_D$ in $K_3Cu_8Te_6$, the metal-insulator transition with a metallic phase at low temperatures in $BaCuS_{3-x}$ and $KCu_3Se_2$ have been observed. Striking correlation between dimensionality of crystal lattice and temperature dependence of resistivity found for several chalcogenides is discussed.

Reasons for this development may by characterized as follow: this class of compounds adopting different structures by varying metal cation composition or the anion stoichiometry or both. In many cases the stabilization of unusual formal valence states of the copper cations and anions (X = S, Se and Te) is observed. The correlation structure-composition-physical properties is not trivial and rather inexplicable. Depending on the actual composition we observed a broad spectrum of transport phenomena such as: linear temperature dependence of resistively $\rho$ down to 10 K ($K_3Cu_8Te_6$), the metal-insulator transition with metallic phase in low temperatures. The correlation between dimensionality of crystal lattice and temperature dependence of resistivity for several chalcogenides has been found.

The physics of complex copper chalcogenides A-Cu-X (A = alkali metal; X = S, Se, Te) is a topic of increasing relevance. Reasons for this development may by characterized as follow: this class of compounds adopting different structures by varying metal cation composition or the anion stoichiometry or both. In many cases the stabilization of unusual formal valence states of the copper cations and anions (X = S, Se and Te) is observed. The correlation structure-composition-physical properties is not trivial and rather inexplicable. Depending on the actual composition we observed a broad spectrum of transport phenomena such as: linear temperature dependence of resistively $\rho$ down to 10 K ($K_3Cu_8Te_6$), the metal-insulator transition with metallic phase in low temperatures. The correlation between dimensionality of crystal lattice and temperature dependence of resistivity for several chalcogenides has been found.