

## Synthesis and some properties of compounds $\text{Cu}_2\text{PrSb}_3\text{S}_7$ and $\text{Cu}_2\text{ErSb}_3\text{S}_7$

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### Abstract

The phase equilibrium in systems of  $\text{CuSbS}_2 - \text{PrSbS}_3$  and  $\text{CuSbS}_2 - \text{ErSbS}_3$  has been studied by physicochemical methods (Differential thermal analysis – DTA, X-ray diffraction phase analysis, Scanning Electron Microscopy – SEM analysis and microhardness testing) and their T-x diagrams were drawn. It was determined that both systems are quazibinary and characterized by formation of  $\text{Cu}_2\text{LnSb}_3\text{S}_7$ -type (Ln = Pr, Er) compounds.

$\text{Cu}_2\text{PrSb}_3\text{S}_7$  melts congruently at 1050 K and is the phase with unstable content. Its dissolution zone changes within concentration interval of 32-37 mole% of  $\text{PrSbS}_3$ .  $\text{Cu}_2\text{PrSb}_3\text{S}_7$  divides the system into two sub-systems:  $\text{CuSbS}_2 - \text{Cu}_2\text{PrSb}_3\text{S}_7$  and  $\text{Cu}_2\text{PrSb}_3\text{S}_7 - \text{PrSbS}_3$ . Both of sub-systems are eutectic. The coordinates of the eutectic point are like following: 15 mole %  $\text{PrSbS}_3$ , T = 740 K and 50 mole %  $\text{PrSbS}_3$ , T = 790 K.

$\text{Cu}_2\text{ErSb}_3\text{S}_7$  melts at 920 K by decomposition. At 725K between  $\text{Cu}_2\text{ErSb}_3\text{S}_7$  and  $\text{CuSbS}_2$  compounds in content of 15 mole % of  $\text{ErSbS}_3$  is formed eutectic balance. 4 mole % of solid solution is formed on base of  $\text{CuSbS}_2$ .

Both compounds are crystallized by naffildite-type structure in the form of rhombic syngonia ( $\text{Cu}_2\text{PrSb}_3\text{S}_7 - a = 1.444; b = 2.146; c = 0.3995 \text{ nm}; z = 4; \text{Cu}_2\text{ErSb}_3\text{S}_7 - a = 1.430; b = 2.128; c = 0.380 \text{ nm}; z = 4$ ; stereogroup Pbnm or Pbn2<sub>1</sub>).

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