

# Preliminary results on the new ternary intermetallic compound $\text{Cu}_5(\text{As,Sb})_2$ in the Cu-As-Sb system

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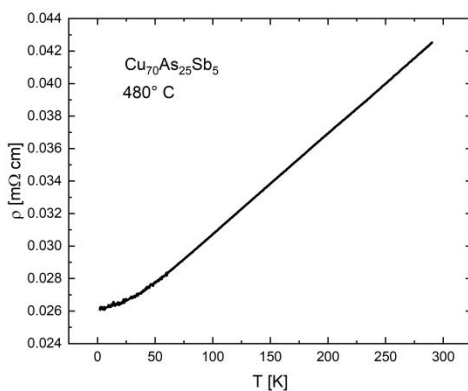
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Studying the ternary system Cu-As-Sb, the new intermetallic compound  $\text{Cu}_5(\text{As,Sb})_2$  has been identified. In this study, we present structural results based on single crystal and powder X-ray diffraction data. Formation and thermal stability have been probed by Differential Thermal Analysis (DTA) and Differential Scanning Calorimetry (DSC). Metallographic and chemical analysis (SEM-EDXS) were performed for providing information on the microstructure and the chemical composition of the intermetallic compound.

A compositional range of Cu (68.9-71.9 at%), As (23.2-28.6 at%) and Sb (2.4-5.1 at%) has been found for this ternary compound. Similarly to the pure binary  $\text{Cu}_{5-x}\text{As}_2$ , the new phase was also found to crystallize also in the orthorhombic  $\text{Mg}_5\text{Ga}_2$ -type (oI28, *Ibam* n. 72) [1]. Like the binary parent, forming peritectically and existing in between 709-300 °C [2], it also forms peritectically and is a high-temperature phase. The lattice parameters have been detected in the range of  $a = 5.968\text{-}5.977(1)$  Å;  $b = 11.55\text{-}11.565(3)$  Å;  $c = 5.530\text{-}5.573(3)$  Å for the high-temperature  $\text{Mg}_5\text{Ga}_2$ -type. A structural change to a primitive cubic structure likely happens on lowering the temperature and before decomposing into  $\text{Cu}_{3-x}\text{As}$  and Sb. The low-temperature cubic phase is currently under investigation; preliminary results show a lattice parameter of  $a = 7.465(1)$  Å.

Some physical properties (electrical resistivity and magnetic susceptibility) have been measured on polycrystalline bulk samples of rhombic  $\text{Cu}_5(\text{As,Sb})_2$  retained at room temperature, as metastable phase, by quenching. We have found that is a good metal with electrical resistivity decreasing monotonically with decreasing the temperature.



**Figure 1.** Resistivity of the new  $\text{Cu}_5(\text{As,Sb})_2$  intermetallic compound.

[1] Pavlyuk, N., Dmytriv, G., Pavlyuk, V. *et al.* *J. Phase Equilib. Diffus.* **43** (2022) pp. 458-470. <https://doi.org/10.1007/s11669-022-00985-2>

[2] Subramanian, P.R., Laughlin, D.E. *Bulletin of Alloy Phase Diagrams* **9** (1988) pp. 605-618. <https://doi.org/10.1007/BF02881964>