

# Magnetic properties and crystal structure of solid-solution $\text{Cu}_2\text{Mn}_x\text{Fe}_{1-x}\text{SnS}_4$ chalcogenides with stannite-type structure

López-Vergara, F.

Galdámez, A.

Manríquez, V.

Barahona, P.

Peña, O.

New solid solutions  $\text{Cu}_2\text{Mn}_x\text{Fe}_{1-x}\text{SnS}_4$  were prepared by direct combination of the corresponding elements at  $850^\circ\text{C}$ . The crystal structure of  $\text{Cu}_2\text{Mn}_{0.4}\text{Fe}_{0.6}\text{SnS}_4$  was determined by single-crystal X-ray diffraction. This phase is described in the space group  $I4-2m$  where each cation is tetrahedrally coordinated to four sulfur anions in a sphalerite-like arrangement. The XRD patterns of the solid solutions  $\text{Cu}_2\text{Mn}_x\text{Fe}_{1-x}\text{SnS}_4$  were fully indexed in the space group  $I4-2m$  and the values of the cell parameter for all phases obey the usual linear Vegard behavior. A progressive evolution of the magnetic moment in the paramagnetic state is observed when increasing the content of manganese. The negative values of the Curie-Weiss constant,  $\theta$ , indicate an antiferromagnetic (AF) behavior with AF interactions, weaker by more than one order of magnitude compared to other diluted magnetic semiconductors (DMSs) with zinc-blende or wurzite crystal structure. © 2014 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.