

Mechanochemical synthesis and thermal stability of Cu-Ag solid solutions

L. Lyubenova, T. Spassov, M. Spassova

Faculty of Chemistry, University of Sofia, 1164 Sofia, Bulgaria.

E-mail: nhtll@chem.uni-sofia.bg

The objective of this work was the study the microstructure, morphology, and thermal stability of different supersaturated solid solutions that would be attractive for fabrication of nanoporous structures. Nanocrystalline $\text{Cu}_{50}\text{Ag}_{40}\text{Al}_{10}$ and $\text{Cu}_{50}\text{Ag}_{40}\text{Sn}_{10}$ solid solutions are synthesized by high energy ball milling. For both compositions milling for 8 h leads to formation of amorphous phase. After 10 h of milling only fcc solid solutions with different lattice parameters are obtained. Increasing the milling time no diffraction peaks of pure Ag and Cu elements can be observed, indicating almost completed alloying process.

Broad overlapped exothermic effects for all samples are detected by DTA. These can be explained with solid solution decomposition and a grain growth process. An exothermic effect at about 340°C can also be detected on the DTA curve of the ball-milled $\text{Cu}_{50}\text{Ag}_{40}\text{Sn}_{10}$ alloy, associated with crystallization of the amorphous phase formed during milling.