

The obtained nanoparticles AgInS₂ in AgNO₃–In₂S₃–C₂H₄(NH₂)₂ systems

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Ternary A^IB^{III}C₂^{VI} compounds are among the important functional materials of modern technology. Most of this class of compounds are widely used or are considered as promising materials with valuable semiconductor, photo-, ferro- and thermoelectric properties. This shows the relevance of research the preparation of nanoparticles of AgInS₂ in AgNO₃–In₂S₃–C₂H₄(NH₂)₂ systems.

The purpose of this work was to study of physical-chemical foundations of nanoparticles of AgInS₂ preparation in ethylenediamine environment.

To investigate the conditions for obtaining, structure and properties of the AgInS₂ compound differential thermal (DTA), X-ray diffraction (XRD) and microstructural (MSA) analysis methods were used.

As precursors for AgInS₂ compounds synthesis in the ethylenediamine medium silver nitrate (AgNO₃) and indium sulfide (In₂S₃) were used. At first In₂S₃ was obtained by the interaction of InCl₃ with CH₃CS(NH₂). Then In₂S₃ with AgNO₃ in an environment of ethylenediamine at molar ratio 3: 2, respectively, were mixed for synthesis of AgInS₂ compound and it was transferred into an autoclave. The resulting precipitate was washed several times with distilled water and ethanol, then dried at 353 K in a vacuum oven for 2 hours. The results of microstructural analysis (HITACHI TM3000) have shown that the synthesized compound consists of nanoparticles. Depending on the concentrations of the components and the temperatures particle of different size and shape were obtained.

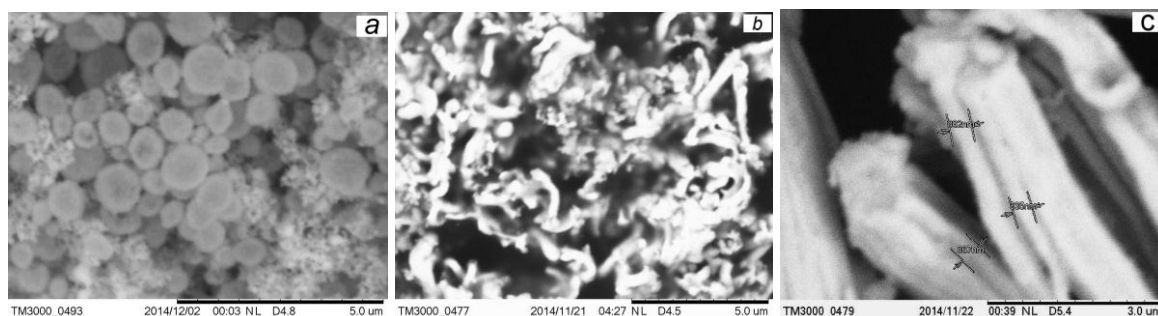


Fig. Micrographs of AgInS₂ nanoparticles obtained: *a* – 383 K, *b* – 410 K, *c* – 450 K

By the DTA and XRD methods the individuality of the resulting compound was proved. Crystallographic studies of the samples have been conducted with X-ray diffractometers 2D PHASER "Bruker" (CuK_α, 2θ, 20–80 deg.). According to XRD data it was revealed that at 383–450 K AgInS₂ is mainly in the amorphous state. The intensity of the diffraction lines of AgInS₂ after thermal treatment corresponds to the literature data [1, 2].

References

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2. M. Ortega-Lopez, O. Vigil-Galan, F.C. Gandarilla, *Materials Research Bulletin* (2003) 38: 55