

Specific Features of the Growth, Structure, and Main Physicochemical Properties of FeGa₂Se₄ Single Crystals

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Abstract.

FeGa₂Se₄ single crystals belonging to the promising class of diluted magnetic semiconductors of the AB₂X₄ type (A is Mn, Fe, Co, or Ni; B is Ga or In; and X is S, Se, or Te) are investigated; this compound is currently used for designing solid-state magnetically controlled devices. Optically homogeneous bulk FeGa₂Se₄ single crystals ~14 mm in

diameter and ~50 mm long are obtained for the first time from melt by the modified Bridgman method. The elemental composition of the crystals is determined by X-ray spectral microprobe analysis; it corresponds to the specified composition in the initial charge. It is established by X-ray diffraction analysis that this compound is crystallized into a cubic sphalerite-type structure with unit-cell parameter $a = 5.498 \pm 0.005 \text{ \AA}$. The melting and crystallization temperatures of the grown FeGa_2Se_4 single crystals are determined by differential thermal analysis. The melting temperature is 1283 K. The microhardness of the single crystals is measured for the first time, the density is determined by the pycnometric method, and the parameters of hyperfine interaction of iron ions are found on the basis of the Mössbauer spectra.

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