

HIGH-ENTROPY FUNCTIONAL MATERIALS BASED ON OXIDES
AND FLUORIDES OF RARE-EARTH ELEMENTS

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Improving the methods of obtaining high-entropy functional materials (HEFM) is a priority in modern investigation in the field of creating constructional materials of a new generation. These materials can be used for manufacturing of constructional and catalytic materials, multiferroics and acousto-optic systems.

In this paper HEFM based on oxides and fluorides of rare-earth elements (REE) were synthesized. The phase composition, structure, and surface morphology of the obtained powders were established by scanning electron microscopy and X-ray phase analysis methods.

The stabilization of structure in such systems can be obtained by high mixing entropy, which provides high thermal resistance of phase composition [1]. Due to the fact that fluorides and oxides of REE have low solubility in water, it means that they can be synthesized by the precipitation method from water solutions of certain salts.

The synthesis can be conditionally divided into six stages: mixing of water solutions of REE nitrates, precipitation, rinsing, filtration, drying and annealing.

An important requirement for powders is their single phase. According to X-ray phase analysis data of a sample with a nominal composition $(La_{0,4}Ce_{0,4}Gd_{0,4}Sc_{0,4}Er_{0,4})F_{3\pm\delta}$ as an example, it was found that this material contains one orthorhombic crystalline phase – ErF₃ type (Fig.1).

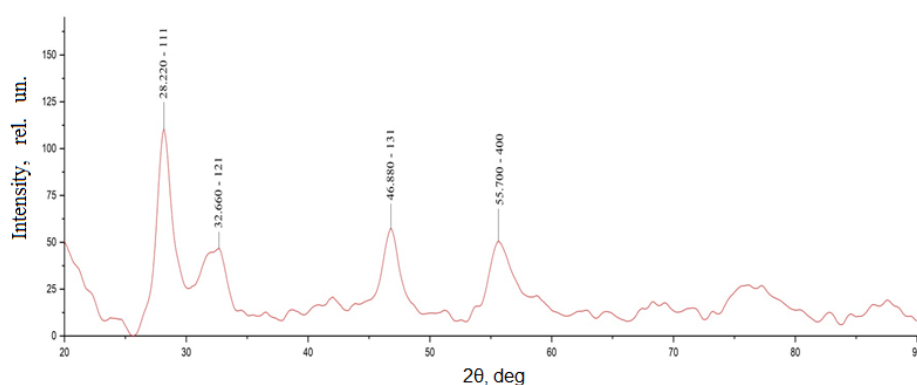


Fig. 1. XDA-spectrum of HEFS $((La_{0,4}Ce_{0,4}Gd_{0,4}Sc_{0,4}Er_{0,4})F_{3\pm\delta})$

In summary, the main steps of the synthesis and prospective applications of materials are shown in the article; the more homogeneous systems were obtained, then in previous research. Obtained systems will be investigated for applicability in laser technology.

REFERENCES

1. Christina M., Sachet E., Borman T., Diskey E.C. et al. // Nature Communication, 2015. P. 1–8.