

# Research and Optimization of Crystallization Processes of Solutions of Hybrid Halide Perovskites of the $\text{CH}_3\text{NH}_3\text{PbI}_3$ Composition

Muratova E. N.,

Moshnikov V. A.,

Aleshin A. N.,

Vrublevsky I. A.<sup>1</sup>,

Lushpa N. V.<sup>1</sup>,

Tuchkovsky A. K.<sup>1</sup>

2023

<sup>1</sup>Belarusian State University of Informatics and Radioelectronics, 6 P. Brovki Street, Minsk 220013 Belarus

**Keywords:** hybrid halide perovskites, crystallization of solutions, surface morphology, granular structure, transmission spectra, solar cells.

**Abstract:** A single-stage centrifugation method is used for the precipitation and crystallization of a solution of a hybrid halide perovskite compound of the  $\text{CH}_3\text{NH}_3\text{PbI}_3$  composition. The perovskite films are annealed in the temperature range of 80–140°C, during which the excess of the *N*-methylpyrrolidone solvent was removed by evaporation. The X-ray phase analysis of the synthesized perovskite layer is carried out. The morphology of the surface of the layers after crystallization and the transmission spectra in the optical range are studied. The experiments and research results showed that the optimal temperature regime for the formation and crystallization of lead triiodide methylammonium perovskite films is 100–110°C. The perovskite layers obtained in these processing regimes have a surface morphology with a

uniform granular crystal structure and are highly uniform. Moreover, in solar cells based on perovskite-like  $\text{CH}_3\text{NH}_3\text{PbI}_3$  structures with an annealing temperature of 100–110°C, the short-circuit currents reached 16.0 mA/cm<sup>2</sup>. At the same time, at annealing temperatures of perovskite layers above 120°C, the maximum value of the short-circuit currents did not exceed 14.0 mA/cm<sup>2</sup>.

Research and Optimization of Crystallization Processes of Solutions of Hybrid Halide Perovskites of the  $\text{CH}_3\text{NH}_3\text{PbI}_3$  Composition / E. N. Muratova [et al.] // Glass Physics and Chemistry. – 2023. – Vol. 49, № 6. – P. 672–679.