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Stability of Optical Responses from Lead-free Perovskite Films*

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Materials with perovskite-type crystal structure attract much attention due to their unique optical properties, such as high quantum yield of photoluminescence and high carrier mobility. However, their further utilization as an active media in photonic and optoelectronic devices is limited by the lack of stability of their optical responses together with the presence of lead cations in the chemical composition. Here, a detailed study of the optical properties and their stability under ambient conditions of perovskite films with the chemical composition $(\text{CH}_3\text{NH}_3)_x\text{A}_y\text{I}_z$, where $A = \text{Pb}, \text{Bi}, \text{Sb}$, was performed. The changes in optical responses of the samples were monitored for 3 months. It was shown that the stability of perovskite films was improved by surface passivation with a thin layer of polymethylmethacrylate onto their surface. The developed procedures of film formation and following surface passivation are of interest in the design of active optical materials based on perovskite films with the increased optical performance.

Key words: Raman spectra, photoluminescence, ferroelectromagnets, bismuth, antimony, PMMA

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