Preparation of Perovskite Films Using Large Organic Cations to Increase Stability to Degradation

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From year to year, energy and electricity consumption of whole humanity increases and this leads to environmental problems because most sources of energy are exhaustible and non-renewable except for the Sun. Therefore, conversion of solar energy into electrical current becomes a possible solution of the problem. Nowadays hybrid perovskite-based solar cells are the most promising type of solar devices. Their maximum efficiency has already reached 25.2%, which is superior to many solar panels. However, there is a big problem related to the decomposition of the perovskite layer under environmental conditions. It is considered that partial substitution of methylammonium cations for larger organic cations in the structure of three-dimensional perovskite contributes to the stabilization of the light-absorbing layer. The goal of our project is to develop a new technique of the perovskite layer formation using large organic cations to increase its stability to degradation in environmental conditions. In our experiments, we partially replaced the methylammonium cation with large organic cations. To study phase composition and morphology of the obtained perovskite films, the methods of X-ray diffraction (XRD) and scanning electron microscopy (SEM) were used, respectively. We investigated stability of obtained perovskite films under various conditions. We also measured the current-voltage characteristics and calculated the efficiency values of the fabricated solar cells.

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