

Unravelling the behavior of Dion–Jacobson layered hybrid perovskites in humid environments.

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Streszczenie

Layered hybrid halide perovskites are known to be more environmentally stable than their 3D analogues. The enhanced stability is particularly relevant for Dion–Jacobson-type layered perovskites due to their promising photovoltaic performances. However, in contrast to the expected resilience to moisture, we reveal that the structure of Dion–Jacobson perovskite phases based on a 1,4-phenylenedimethan ammonium spacer is disrupted in humid conditions using X-ray diffraction, UV–vis spectroscopy, thermogravimetric analysis, and solid-state NMR spectroscopy. The process takes place at $\geq 65 \pm 5\%$ relative humidity, with a time scale on the order of minutes. The original layered structure can be restored upon annealing and the hydration can be suppressed by postsynthetic annealing in air, which is attributed to the generation of a self-protective layer of PbI_2 . This study thereby reveals a unique behavior of layered perovskites in humid environments, which is critical to their stabilizing role in perovskite devices.

Słowa kluczowe

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