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Unraveling origin of performance instability in mixed perovskite solar cells — •Małgorzata Kot[1], Chittaranjan Das[2], Tim Hellmann[2], Carolin Wittich[2], Iwan Zimmermann[3], Mohammad Khaja Nazeeruddin[3], Wolfram Jaegermann[2], and Jan Ingo Flege[1] — [1]BTU Cottbus-Senftenberg, Germany — [2]TU Darmstadt, Germany — [3]EPFL Lausanne, Switzerland

A degradation mechanism of mixed perovskite solar cells is mostly attributed to the segregation of halide phases in the perovskite film. However, our studies have revealed, that the mixed perovskites degrade due to the migration of iodine and methylammonium ions across the solar cell. Nonetheless, an ultrathin RT-ALD-Al_2O_3 layer deposited on top of perovskite can very effectively limit this migration thanks to the reactive property of this interface.[1-3] Namely, there is a closed cycle of the charge transfer between ALD and perovskite films. Such ALD film doesn't cause any drastic changes in the perovskite morphology, chemical composition, optoelectronic properties or crystallinity. What more, it helps to preserve the initial properties of the film during exposure to the light and ambient air under real operating conditions and thus improves the stability of the solar cells. This ultra-thin Al_2O_3 layer prepared in an unusual RT process for ALD method significantly increases the lifetime of perovskite solar cells at a very low cost bringing thus the introduction of the perovskite solar cells into mass production. [1] M. Kot et al., ChemSusChem 11 (2018) 3640. [2] M. Kot et al., Energy Technol. 7 (2019) 1900975. [3] D. Schmeißer et al., J. Phys. Chem. C 123 (2019) 23352.

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