Electronic supplementary information

Influence of the mobile ions on the electroluminescence of perovskite solar cells

Enrico Bandiello,[a] Jorge Ávila,[a] Lidón Gil-Escrig,[a] Eelco Tekelenburg,[b] Michele Sessolo*[a] and Henk J. Bolink[a]

[a] Instituto de Ciencia Molecular, Universidad de Valencia, C/ Catedrático J. Beltrán 2, 46980 Paterna, Spain. *E-mail: michele.sessolo@uv.es

b Faculty of Mathematics and Natural Sciences, University of Groningen, Nijenborgh 4, 9747 AG, Groningen, The Netherlands.

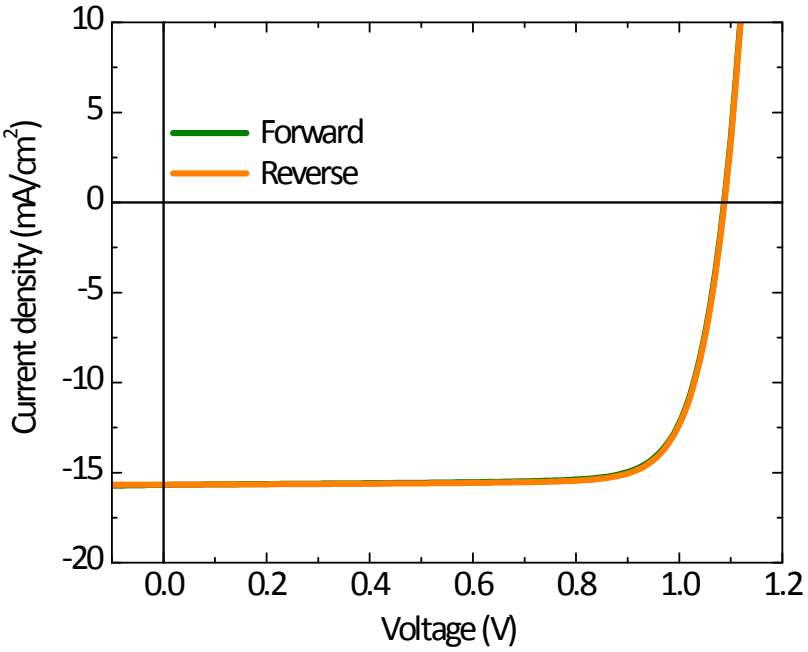

Fig. S1 Electrical characterization under illumination for a solar cells with the structure ITO/PEDOT:PSS/polyTPD/$MAPbI_3$/PCBM/Ba-Ag, where the perovskite absorber thickness is 350 nm. The voltage scan speed is 0.35 V s^{-1}, in forward (negative to positive) and in reverse (positive to negative) bias.

	J_{sc} (mA cm^{-2})	V_{oc} (mV)	*FF* (%)	*PCE* (%)
Forward	15.7	1087	79.7	13.6
Reverse	15.7	1088	80.2	13.7

Table S1. Photovoltaic parameters of the solar cell reported in Figure S1.

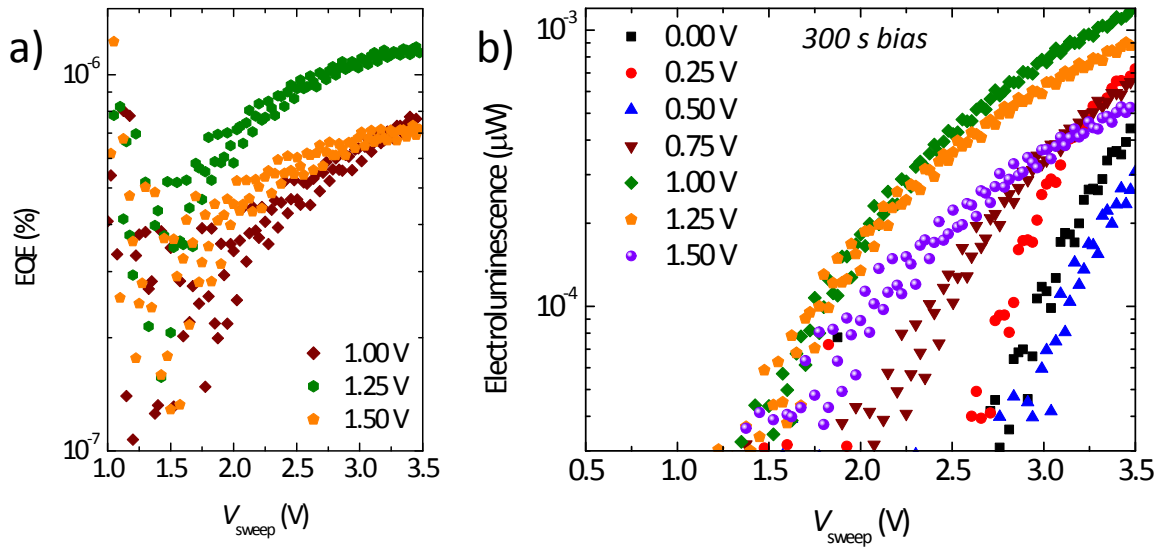

Fig. S2 (a) EQE and (b) electroluminescence for the non-ohmic device B when biased in dark for 300 s.

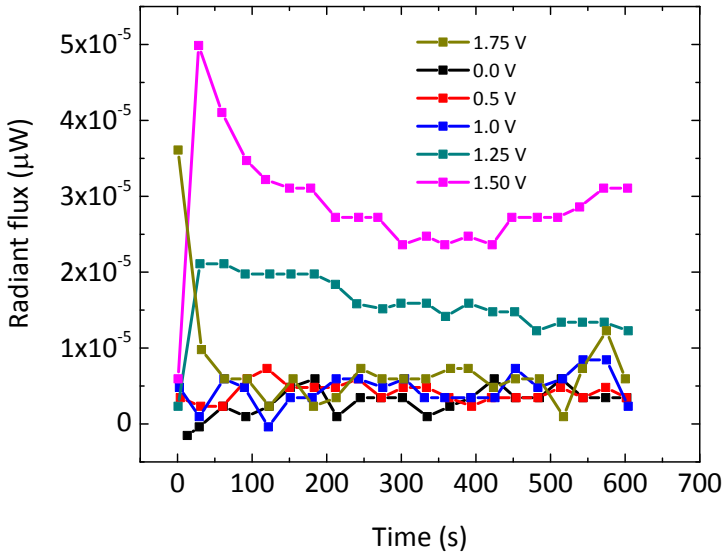

Fig. S3 DC component of the electroluminescence for the perovskite diode B (single carrier device) for increasing constant driving voltage (V_{bias}).

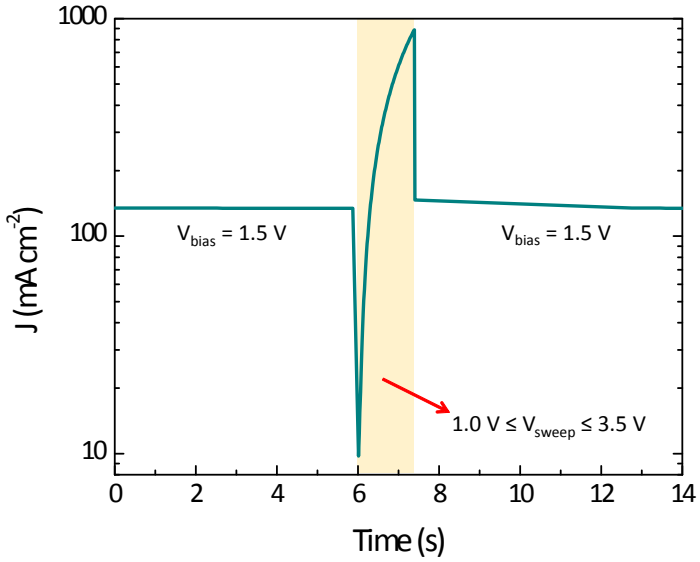

Fig. S4 Time dependent current density curve showing the recovery of the current density after the fast J-V sweep, for device B.

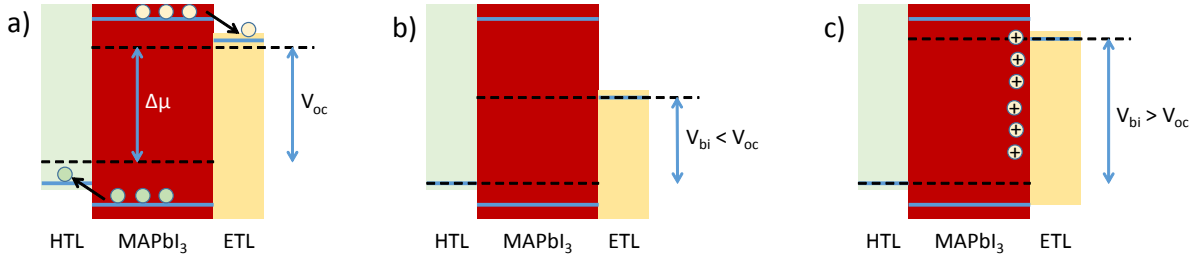

Fig. S5 (a) Simplified band diagram indicating the maximum attainable V_{oc} as related to the quasi-Fermi level splitting Δμ. (b) In a degraded solar cells, an extraction barrier is present at least at one of the interface (here the ETL), reducing the device built-in voltage and causing s-shaped J-V characteristics. (c) Forward biasing the device reduced the barrier for the electron injection (extraction), hence recovering the V_{bi} and the device FF.