Supplementary Information

Enhanced charge carrier mobility and lifetime suppress hysteresis and improve efficiency in planar perovskite solar cells

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Keywords: Planar perovskite solar cell, photovoltaics, morphology, perovskite crystals, open-circuit voltage, THz spectroscopy, mobility in perovskites, hysteresis.

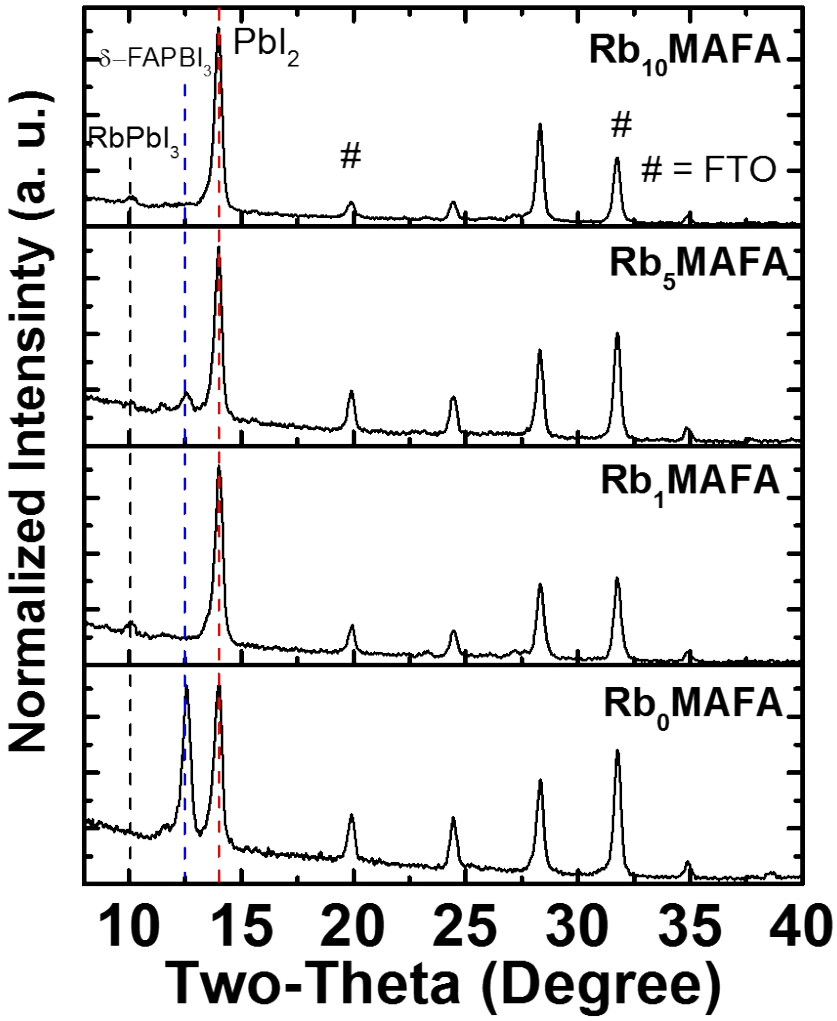

Figure S1. XRD of the Rb_xMAFA series.

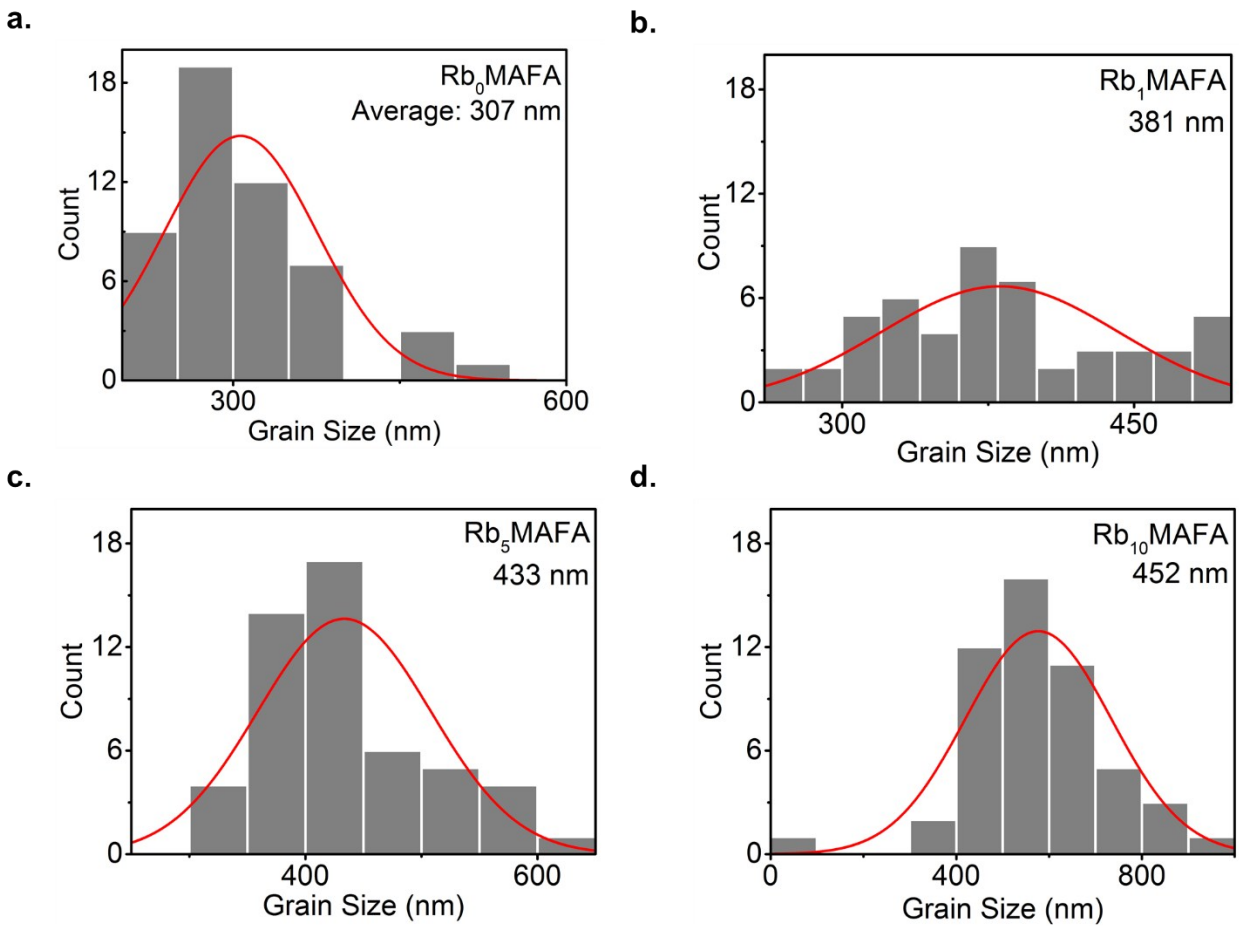

Figure S2. Histograms for the all differences concentrations of RbI, This calculation was made in the ImageJ software, the average was made with 50 grains.

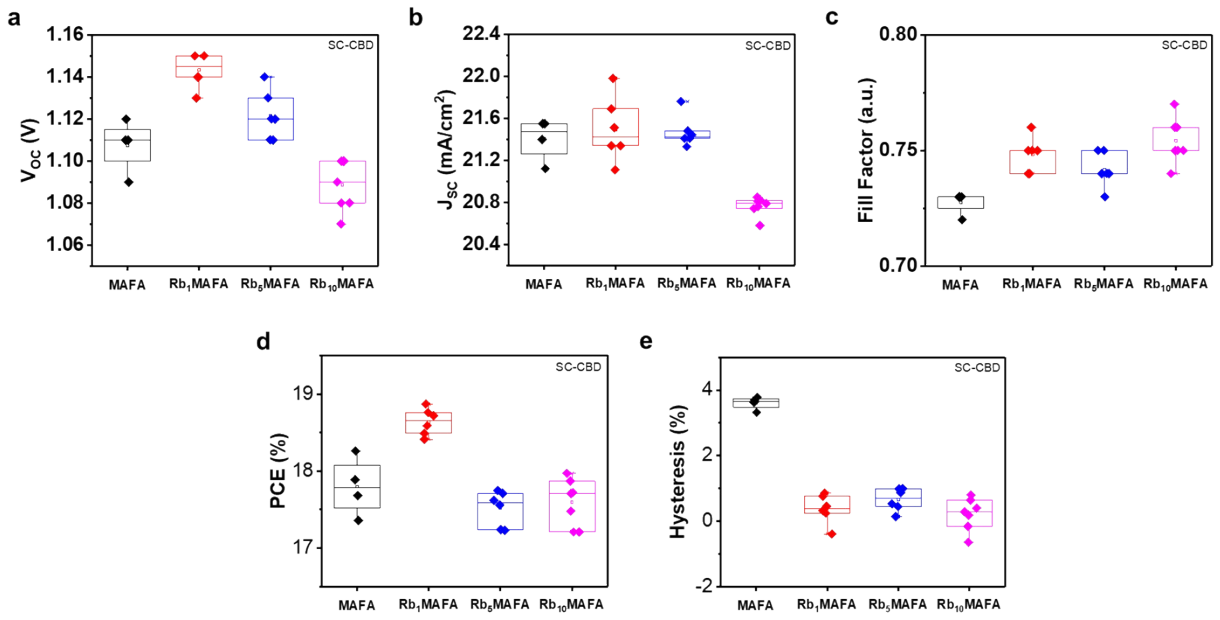

Figure S3. Boxplots for different solar cell metrics for devices made by spin coating and chemical bath (SC-CBD) deposited SnOx with different concentrations of Rb in MAFA perovskites. a. V_{oc}, **b.** J_{sc}, **c.** Fill Factor, **d.** PCE and **e.** hysteresis (defined as the difference in efficiency between the backward and forward scan).

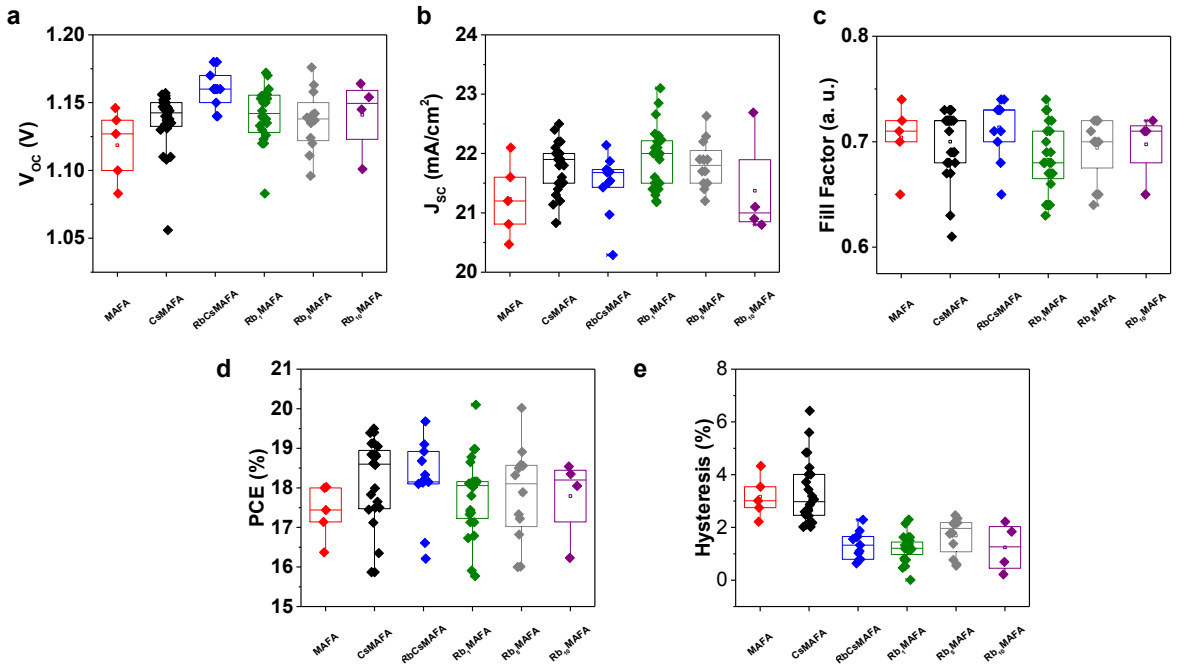

Figure S4. Photovoltaic parameters extracted from several batches of PSCs a. V_{oc}, **b.** J_{sc}, **c.** Fill Factor, **d.** PCE and **e.** hysteresis (defined as the difference in efficiency between the backward and forward scan), statistics of 40 devices measured with a scan rate of 10 mV s^{-1} without preconditioning, such as light soaking or long-term forward voltage biasing. These values were taken from the backward scan of devices.

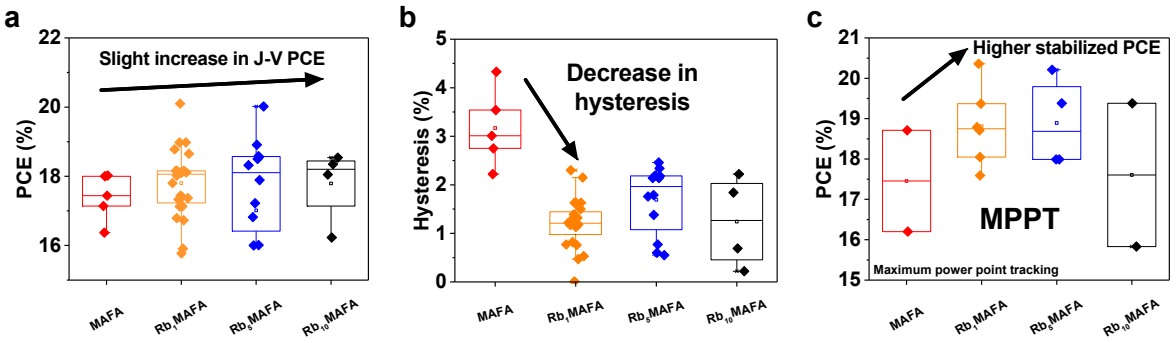

Figure S5. Investigation of efficiency from **a.** the backward scan of the J-V curve and its relation to **b.** hysteresis and **c.** stabilized efficiency by MPPT.

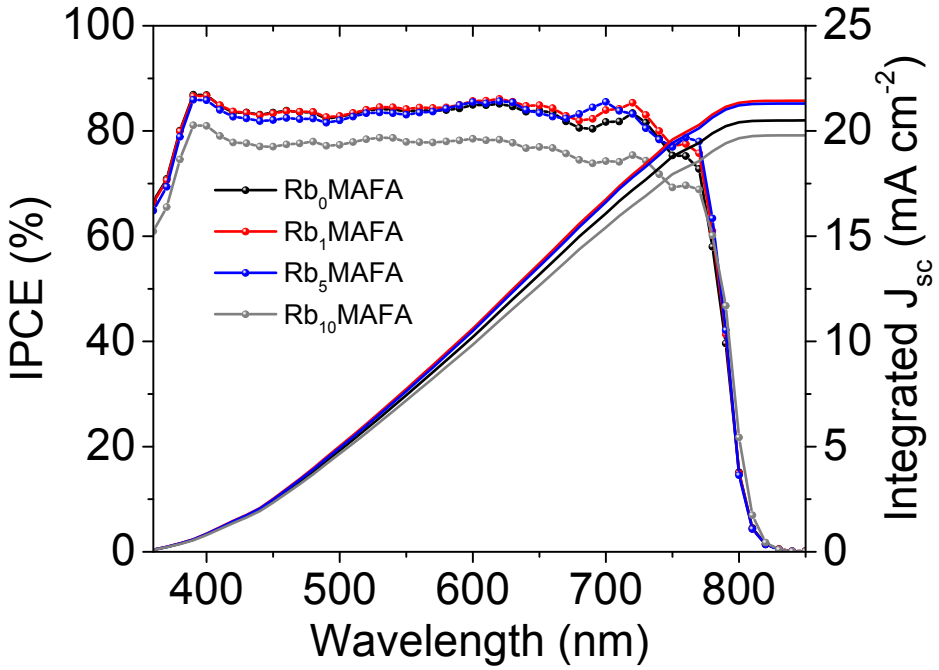

Figure S6. IPCE data for all differences amount of Rb.

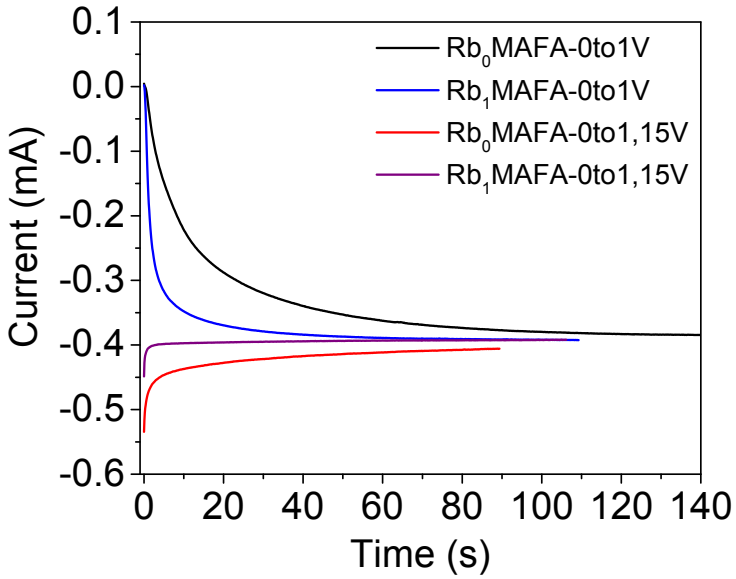

Figure S7. Photocurrent transients for after pre-biasing a 0 V and switching to 1 or 1.15 V.