Supplementary Information for Publication

Atmospheric Influence upon Crystallization and Electronic Disorder and Its Impact on the Photo-Physical Properties of Organic-Inorganic Perovskite Solar Cells

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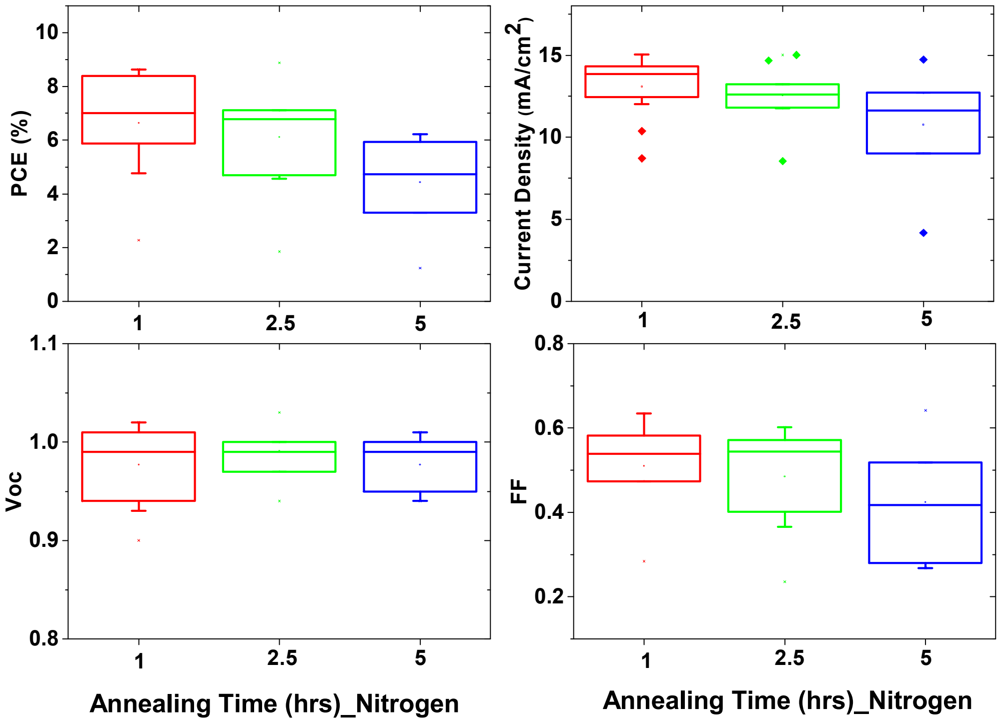

Figure S 1a: Solar cell performance parameter (Efficiency, Jsc, FF and Voc) for device annealed under nitrogen atmosphere, recorded under AM 1.5 simulated sun light (100 mW cm-2).

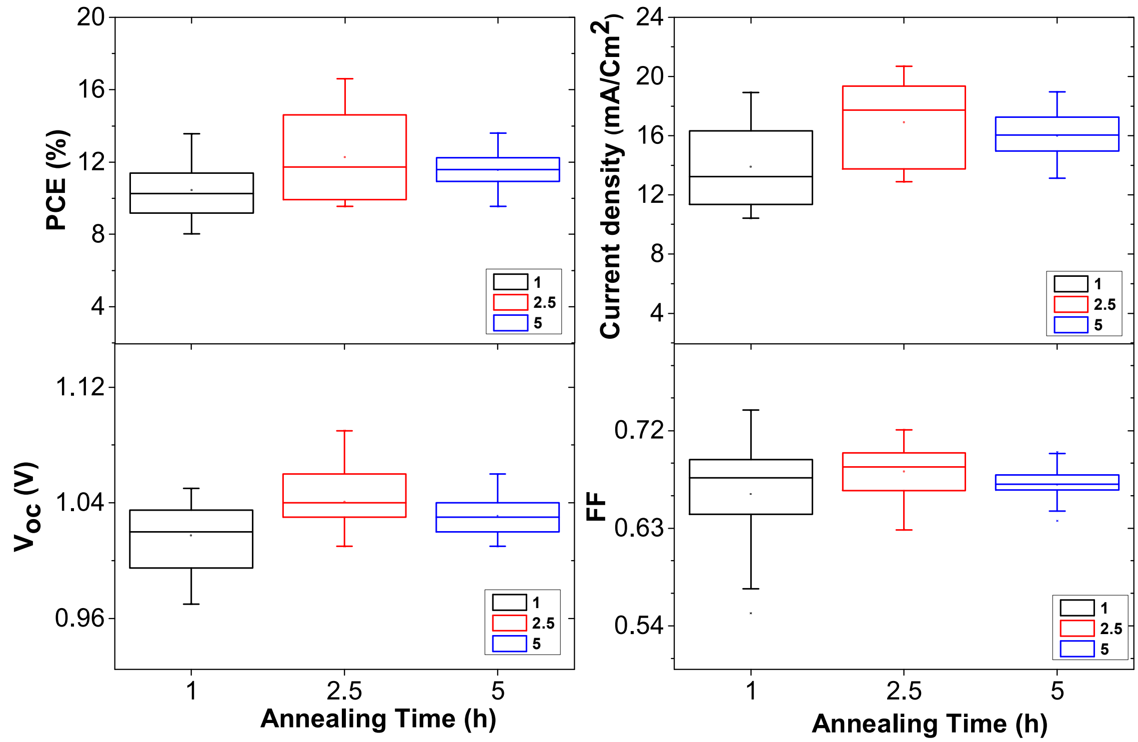

Figure S 1b: Solar cell performance parameter (Efficiency, Jsc, FF and Voc) for device annealed under air atmosphere, recorded under AM 1.5 simulated sun light (100 mW cm-2).

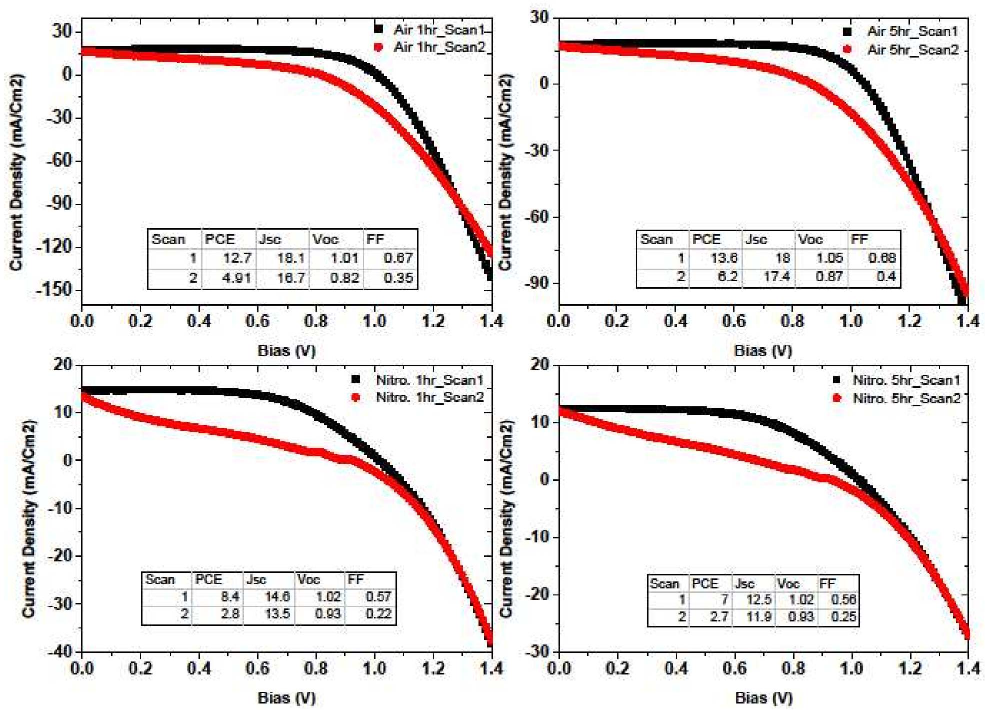

Figure S2: Anomalous hysteresis in the current-voltage curves measured from forward bias to short circuit (scan1) and from short circuit to forward bias (scan 2)under simulated 1.5 AM (100 mW cm^{-2}) sun light for; (top panel) air annealed perovskite and (bottom panel) for nitrogen annealed samples. Hysteresis in JV curves appears to be higher for sample annealed under nitrogen atmosphere as compared with the air annealed samples. Annealing time does not appear to be influencing the hysteresis in JV curve too much.

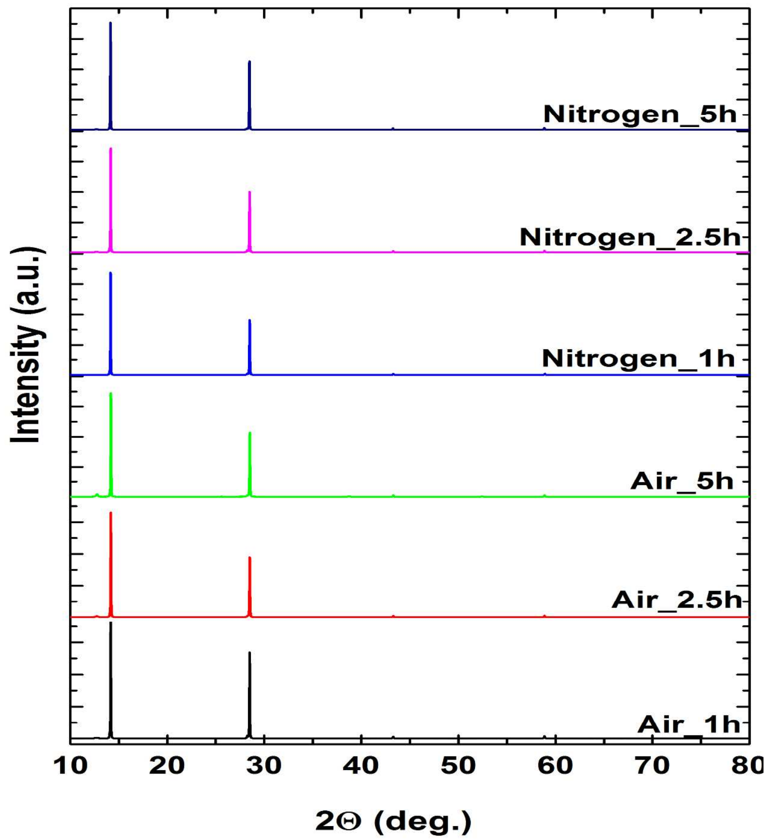

Figure S3: X-ray spectrum of spin coated thin film $CH_3NH_3PBX_3$ perovskite, isothermally (100 °C) annealed under different atmosphere (*i.e.* air and nitrogen) for 1, 2.5 and 5h.

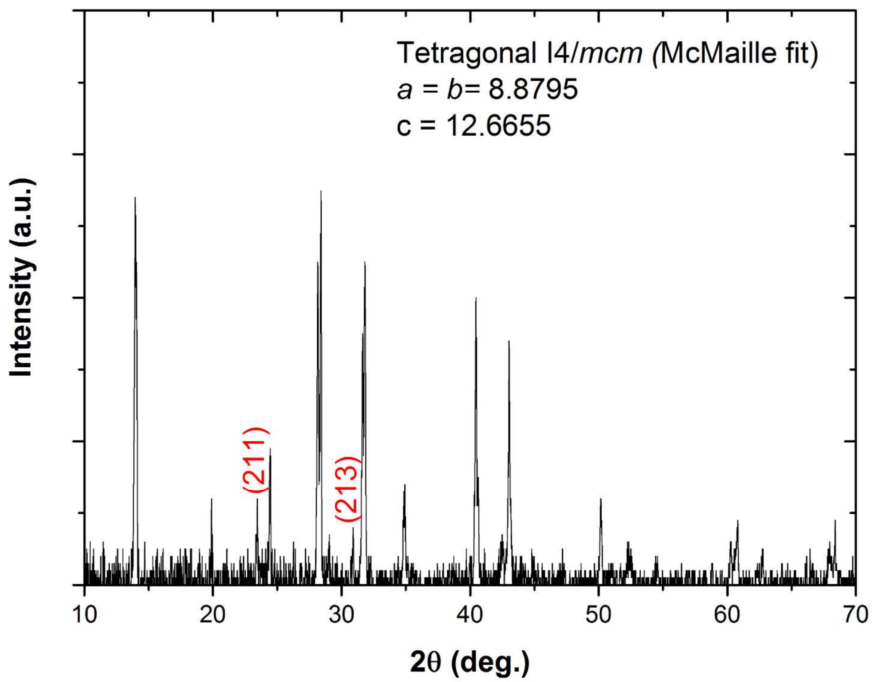

Figure S4: Powder x-ray diffraction pattern of $CH_3NH_3PBX_3$ confirming a predominant tetragonal symmetry (I4/mcm). The lattice parameter is calculated using McMaille fit. The signature peaks (211) and (213) of tetragonal symmetry become apparent only on powder; in thin film due to strong orientation they remain undetected.

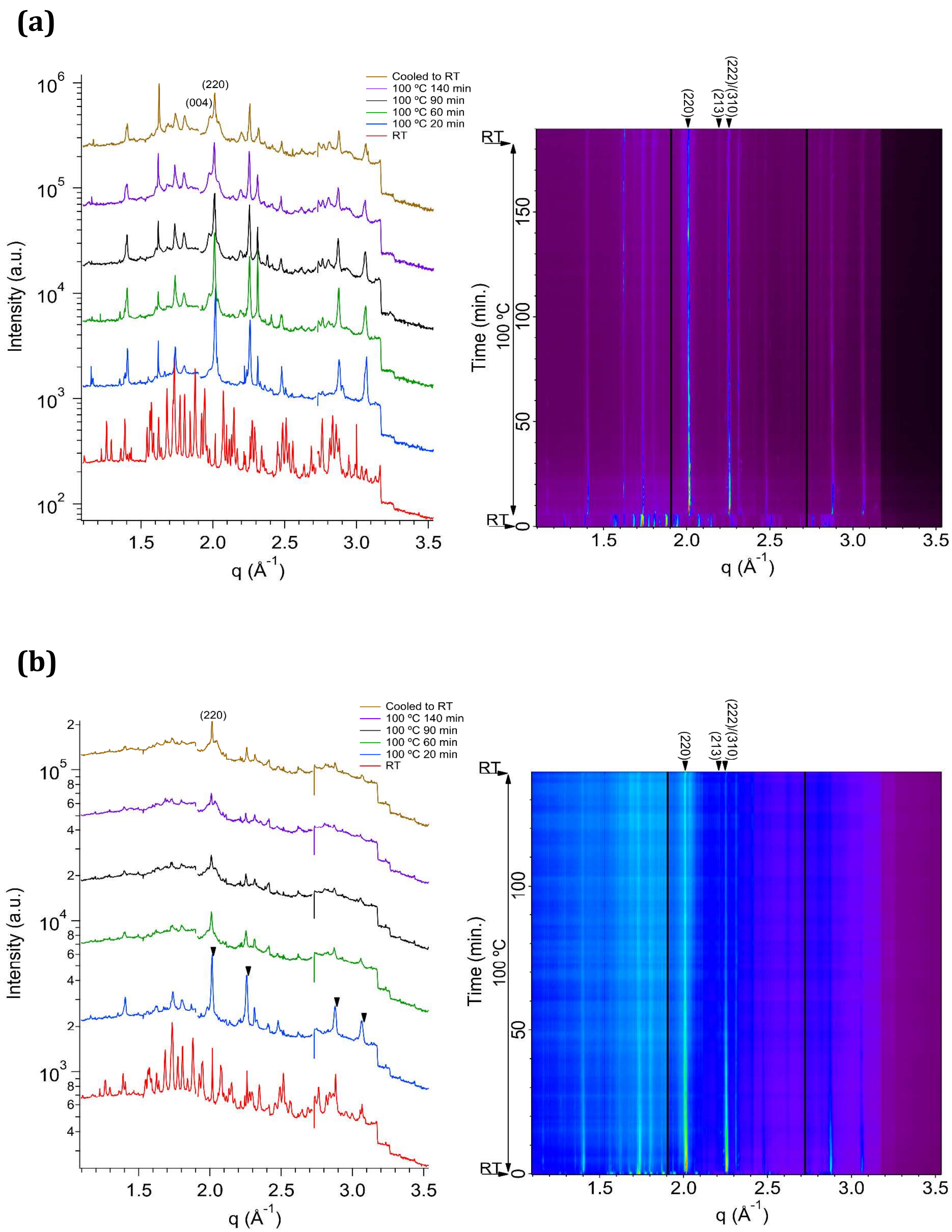

Figure S5: 2D plots of the WAXS profiles as a function of the annealing time of perovskite samples annealed in-situ under (a) air and (b) nitrogen with relative contour plots (top).