Crystallization of Perovskite Film for Higher Performance Solar Cells by Controlling Water Concentration in Methyl Ammonium Iodide Precursor Solution

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Figure S1 (a) and (b) shows the topography line profile of annealed and unanealed perovskite film prepared from 0% and 5% water in MAI solution. The line profile shows that the grain size of perovskite film prepared from 5% water in MAI solution is higher than the grain size of perovskite film prepared from 0% water in MAI solution.

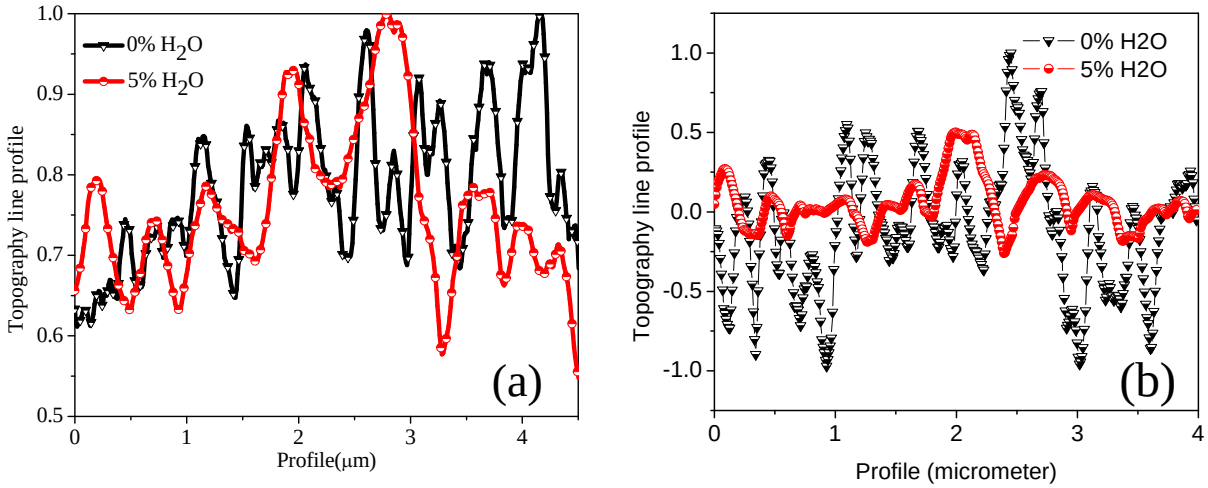

Figure S1. Topography line profile of annealed perovskite film prepared from 0% and 5% water in MAI solution from sequential deposition method

Figure S2 shows Kelvin probe force microscopy (KPFM) images of Perovskite films prepared from 0%, 1%, 3%, 5% and 7% water in MAI solution from sequential deposition method. KPFM of Perovskite films demonstrates higher surface potential at the grain boundaries (GBs) than within grains giving downward band bending in the energy band diagram leading to the minority carrier electrons in p-type absorber layer to be attracted towards GBs. Average potential of the Perovskite solar cells prepared from 5% water in MAI solution gives highest surface potential showing reduced surface defects in the prepared Perovskite films.

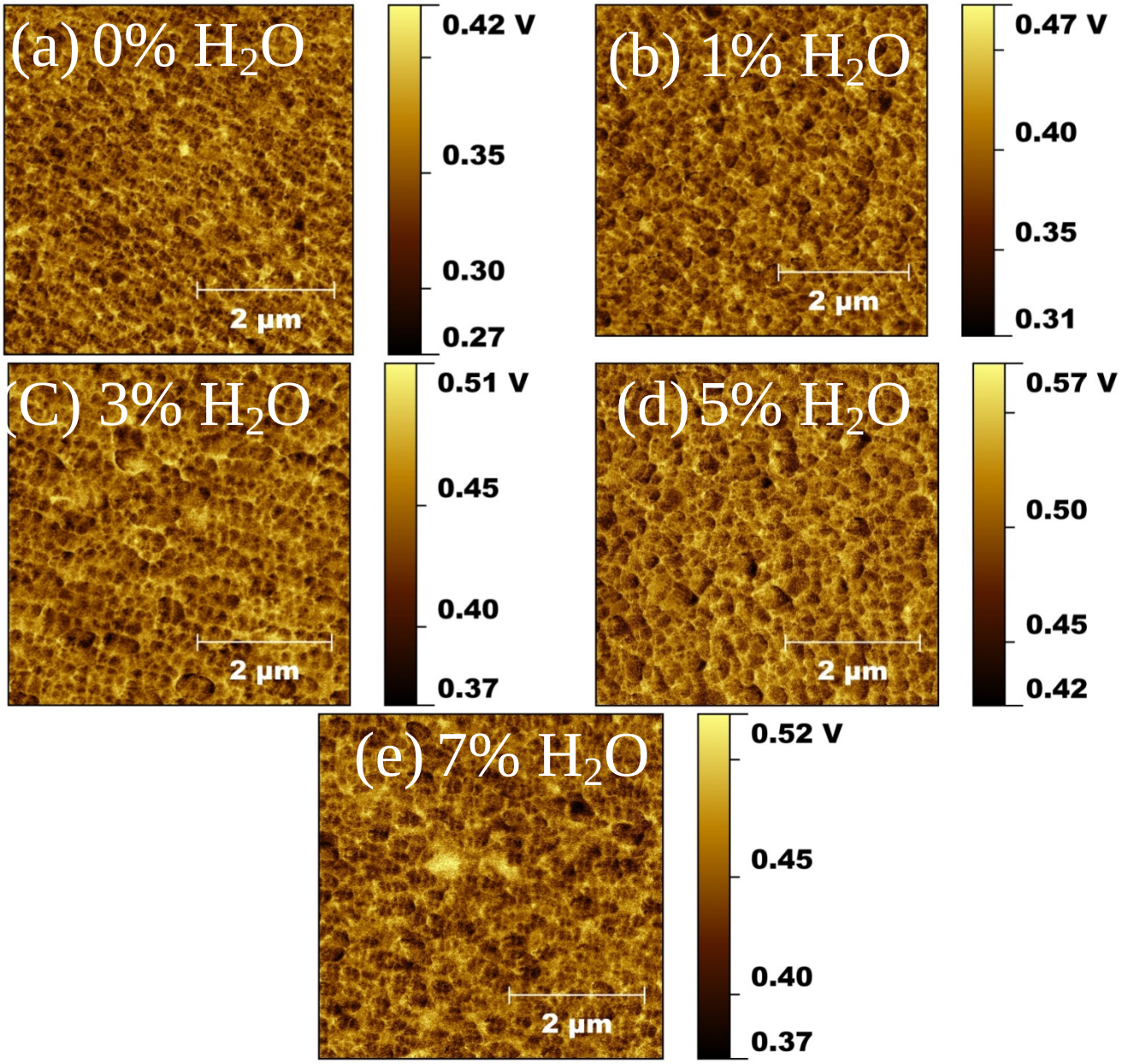

Figure S2. Surface potential images of Perovskite films prepared from 0%, 1%, 3%, 5% and 7% water in MAI solution from sequential deposition method.

Figure S3 shows SEM images of Perovskite films prepared from 0%, 1%, 3%, 5% and 7% water in MAI solution from sequential deposition method.

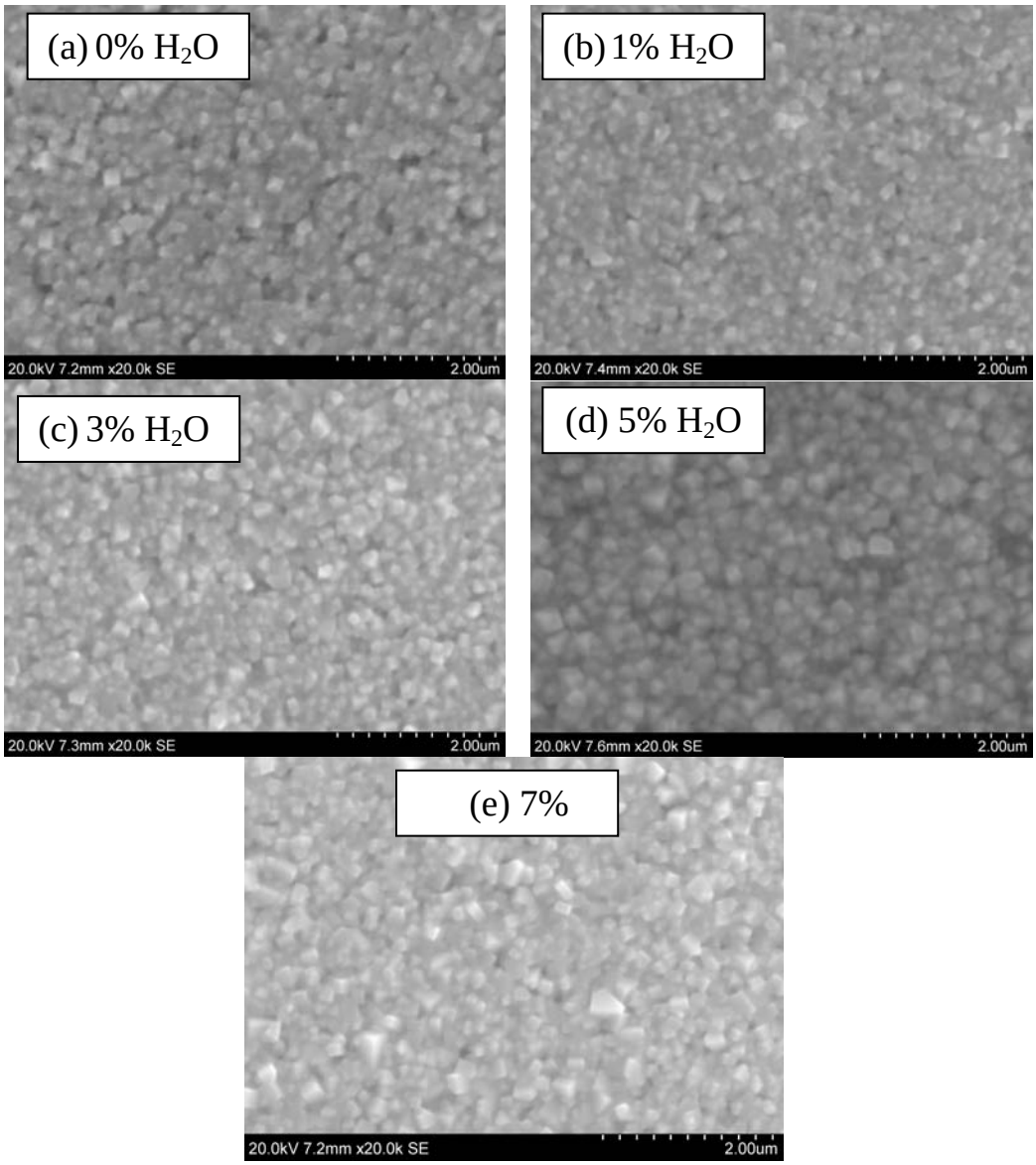

Figure S3. SEM images of Perovskite film prepared from 0%, 1%, 3%, 5% and 7% water in MAI solution from sequential deposition method

Figure S4. JV curves of Perovskite solar cells prepared from 0%, 1%, 3%, 5% and 7% water in MAI solution from sequential deposition method. All solar cells with area 0.16 cm^2 were characterized in the same conditions with 0.5V/sec scan rate in both forward and reverse scan sweeping from 0 to 1V at a relative humidity of 40% in ambient conditions.

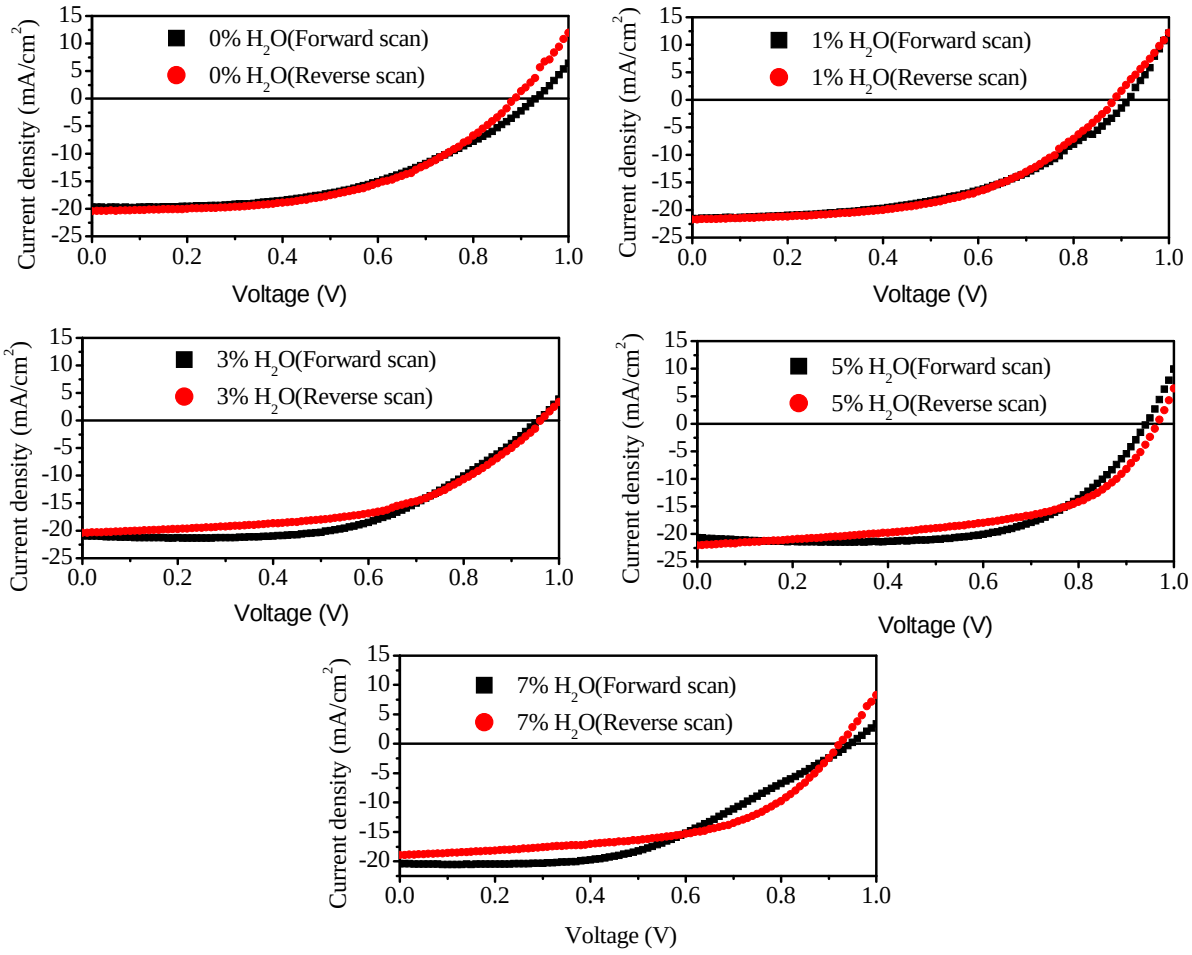

Figure S4. JV curves of Perovskite solar cells prepared from 0%, 1%, 3%, 5% and 7% water in MAI solution in forward and reverse scan from sequential deposition method.