Aging of Solution processed perovskite solar cells

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In recent years, perovskite ($CH_3NH_3PbI_{3-X}Cl_X$) solar cells have been studied steadily due to their potential properties: low-cost processing and possibility to produce large area by low temperature processes. The perovskite film used as light absorber is obtained by solution process and has a crystalline structure. Many different solvents are being developed and gradually adopted for high-performance inorganic-organic hybrid perovskite solar cells. PEDOT:PSS and $PC_{60}BM$ are used as hole transport layer (HTL) and electron transport layer (ETL), respectively. The size of active area is 0.28cm^2. In this study, 9.54% of power conversion efficiency (PCE) is obtained with a saturated current density (Jsc) of 15.03 mA/cm^2. The degradation of the performance of the solar cell is studied with XRD measurements as well as electrical characterizations. The perovskite solar cell performance decreases with aging time (Table 1 and Figure 1a) and XRD data show the growing of the PbI_2 peak and a decreasing of the $CH_3NH_3PbI_3$ (MAPbI3) peak.

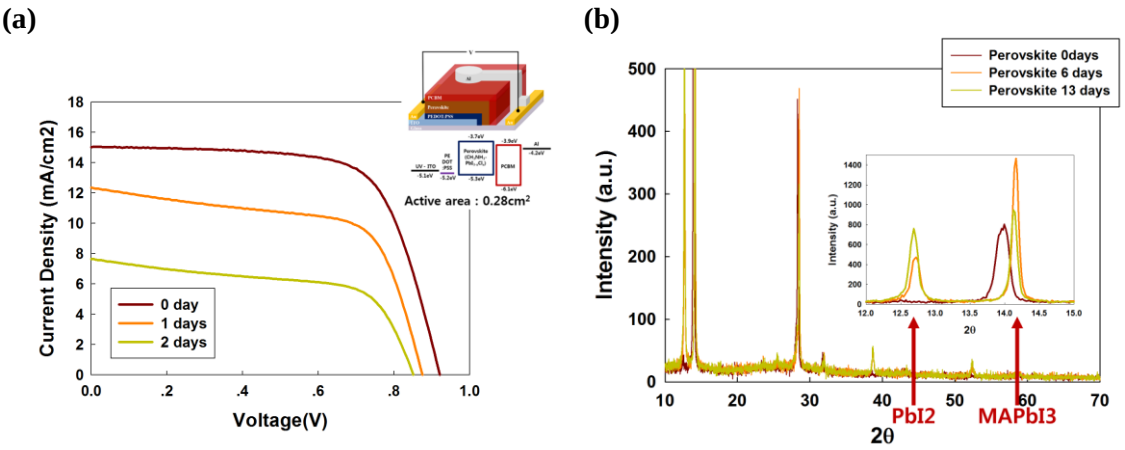

Fig. 1: (a) J-V curve of best performance in 3 days with full device structure and energy band-diagram of solar cells device in this study, (b) XRD data after 0, 6 and 13 days

After # Day	Jsc (mA/cm^2)	Voc (V)	FF (%)	PCE (%)	Rs	Rsh
0 day	15.03	0.92	69	9.54	9.52	3130
1 day	12.37	0.87	65	6.93	10.3	250
2days	7.65	0.85	61	3.96	14.5	261

Table 1: Basic parameters of perovskite solar cells to check degradation in this study