Area: Perovskite solar cells

HIGH EFFICIENT AND STABLE $MAPBI_3$ BASED PEROVSKITE SOLAR CELLS

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High efficiency and stability are of great importance for the application of perovskite solar cell (PSC), a promising low-cost photovoltaic technology. Recently, multi-cation perovskites like Cs/MA/FA or Cs/Rb/MA/FA based ones have been developed and exhibited unexpected properties that enabled high device efficiency as well as stability. However, such complicated compositions may increase the difficulties of low-cost and reproducible device fabrication, especially in consideration of large scale production for future commercialization. In this presentation, we show that $MAPbI_3$, the most simply processible perovskite, can also deliver very high photovoltaic efficiency and thermal stability. We developed an "additive engineering" method that can generate large area uniform perovskite thin films with large crystals and low trap densities. By using the high quality $MAPbI_3$, an energy conversion efficiency of 19.19% was achieved for devices with an aperture area of 1.025 cm^2 (certified by National Institute of Advanced Industrial Science and Technology, AIST). We further designed a nanostructured carbon layer to suppress the diffusion of ions/molecules, an important degradation process within PSCs. Thus the PSCs based on $MAPbI_3$ had been stable during the entire test of a thermal aging test at 85℃ for over 500 hours, or light soaking for 1,000 hours. These finding might be useful for practical deployment of PSCs, in consideration of such high performance achieved by simple perovskite composition.

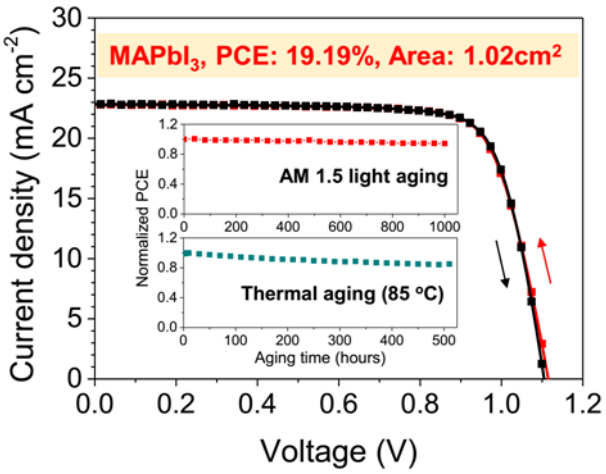

Figure 1: Efficiency and stability of $MAPbI_3$ based PSC with an aperture area of 1.025 cm^2