

Fabrication of Perovskite solar cell by using E-beam Evaporated TiO₂ Photoelectrode

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【Introduction】 The perovskite solar cells have the great potentials of fabrication by printing processing, therefore they have been considered as the most promising cost-efficient solar cell [1]. Lead halide perovskite possess most of the crucial properties which required by the high performance and low cost solar cells [2]. The aim of this work is to fabricate perovskite solar cell. The TiO₂ films have been deposited on ITO substrate by electron beam evaporation at room temperature. The effect of using chloroform during deposition of perovskite layer has been investigated and discussed.

【Experimental】 The TiO₂ films were deposited on indium-doped tin oxide (ITO) substrate by Electron-beam evaporation system at room temperature [3]. After the chamber was evacuated to a background pressure below 4×10^{-6} Torr, The film thicknesses of all the TiO₂ films were around 50 nm measured by computer controlled crystal. Perovskite was layered on TiO₂ by spin-coating method with and w/o using chloroform. The α -NPD and MoO₃ were used as hole- transport material. The prepared TiO₂ films were characterized by using X-ray diffractometer (XRD), field emission scanning electron microscope (FE-SEM). The active cell area was 0.38 cm². The photovoltaic performances of DSCs were measured using a semiconductor parameter analyzer and solar simulator AM 1.5.

【Results and discussions】 Figure 1(a) shows the XRD pattern. The w/o chloroform is exhibited the strong and highest number of crystalline peaks of perovskite than with chloroform perovskite. From Fig. 1(b) and (c) are the FESEM images of perovskite with and w/o chloroform. It is cleared that grain cluster of w/o chloroform based perovskite is smaller than with chloroform perovskite. Fig. 1(d) and (e) is the prepared perovskite solar cell w/o and with chloroform during deposition of perovskite. It is cleared that the color of perovskite solar cell has been changed black to pink color due to use of chloroform, which means perovskite with chloroform has been provided better photovoltaic performance than the w/o one.

【Conclusion】 The perovskite solar cell were successfully fabricated with and w/o chloroform during deposition of perovskite layer on TiO₂ films. The perovskite had good crystallinity. The solar cell with chloroform-rinsed perovskite was showed good photovoltaic performance than w/o chloroform-based solar cell.

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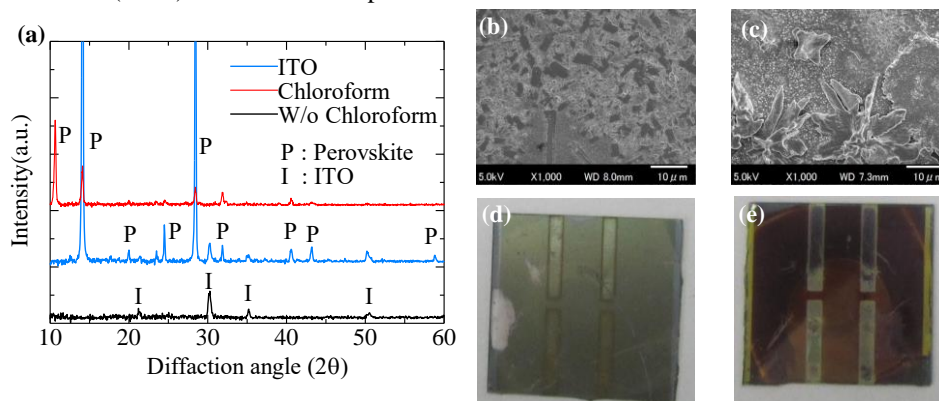


Fig. 1 (a) XRD pattern for ITO, with Chloroform, w/o chloroform, FESEM images of (b) without chloroform, and (c) with chloroform; Images of solar cell: (d) without chloroform, and (e) with chloroform;

【References】

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