High Transparent, High Mobility MoO3 Intergraded InZnO Films for Use as a Transparent Anode in Organic Solar cells

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We reported on the electrical, optical, structural and morphological properties fabricated by co-sputtering for use as an anode for organic solar cells (OSCs). By adjusting RF and DC power of MoO3 and IZO targets during co-sputtering, we fabricated the MoO3-IZO electrode with graded content of the MoO3 on the IZO films. At optimized MoO3 thickness of 20 nm, the MoO3 graded IZO electrode showed a higher mobility (33 cm²/V-Sec) than directly deposited MoO3 on IZO film (26 cm²/V-Sec). At visible range (400nm–800nm), optical transmittance of the MoO3 graded IZO electrode is higher than that of directly deposited MoO3 on IZO film. High mobility of MoO3 graded on IZO is attributed to less interface scattering between MoO3 and IZO. To investigate the feasibility of MoO3 graded IZO films, we fabricated conventional P3HT:PCBM based OSCs with MoO3 graded IZO as a function of MoO3 thickness. The OSC fabricated on the MoO3 graded IZO anode showed a fill factor of 66.53%, a short circuit current of 8.121 mA/cm², an open circuit voltage of 0.592 V, and a power conversion efficiency of 3.2% comparable to OSC fabricated on ITO anode and higher than directly deposited MoO3 on IZO film. We suggested possible mechanism to explain the high performance of OSCs with a MoO3 graded IZO.

Keywords: Transparent conducting oxide (TCO), graded, Organic solar cell