

EM-P015

### Nanodome-patterned Transparent Conductor for Highly Responsive Photoelectric Device

홍승혁<sup>1</sup>, 윤주형<sup>2</sup>, 박형호<sup>3</sup>, 강길모<sup>1</sup>, 서철원<sup>1</sup>, 김준동<sup>1</sup>

<sup>1</sup>인천대학교, <sup>2</sup>뉴욕주립대학교, <sup>3</sup>나노팹센터

An effective light-managing structure has been achieved by using a nano-imprint method. A transparent conductor of indium-tin-oxide (ITO) was periodically nanodome-shaped to have a height of 200 nm with a diameter of 340 nm on a p-type Si substrate. This spontaneously formed a heterojunction between the ITO layer and Si substrate and effectively reduced the light-reflection. The ITO nanodome device response was significantly enhanced to 6010 from the value of 72.9 of a planar ITO film. The transparent conducting ITO nanodome structure efficiently manipulates the incident light driving into the light-absorber and can be applied in various photoelectric applications.

**Keyword:** solar cell heterojunction

EM-P016

### Brush-painted Ti-doped In<sub>2</sub>O<sub>3</sub> Transparent Conducting Electrodes Using Nano-particle Solution for Printable Organic Solar Cells

정진아, 김한기

정보전자신소재공학과, 경희대학교

We have demonstrated that simple brush-painted Ti-doped In<sub>2</sub>O<sub>3</sub>(TIO) films can be used as a cost effective transparent anodes for organic solar cells (OSCs). We examined the RTA effects on the electrical, optical, and structural properties of the brush painted TIO electrodes. By the direct brushing of TIO nano-particle ink and rapid thermal annealing (RTA), we can simply obtain TIO electrodes with a low sheet resistance of 28.25 Ohm/square and a high optical transmittance of 85.48% under atmospheric ambient conditions. Furthermore, improvements in the connectivity of the TIO nanoparticles in the top region during the RTA process play an important role in reducing the resistivity of the brush-painted TIO anode. In particular, the brush painted TIO films showed a much higher mobility (33.4 cm<sup>2</sup>/V-s) than that of previously reported solution-process transparent oxide films (1~5 cm<sup>2</sup>/V-s) due to the effects of the Ti dopant with higher Lewis acid strength (3.06) and the reduced contact resistance of TIO nanoparticles. The OSCs fabricated on the brush-painted TIO films exhibited cell-performance with an open circuit voltage (Voc) of 0.61 V, shot circuit current (Jsc) of 7.90 mA/cm<sup>2</sup>, fill factor (FF) of 61%, and power conversion efficiency (PCE) of 2.94%. This indicates that brush-painted TIO film is a promising cost-effective transparent electrode for printing-based OSCs with its simple process and high performance.

**Keywords:** Brush-painting process, Ti-doped In<sub>2</sub>O<sub>3</sub>, Nano-particle solution, Transparent conducting electrode, Organic solar cells