EW-001

Optimization and improvement about DSSCs efficiency as thickness of TiO2 photoelectrode with Al back-reflector

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To replace the based on silicon solar cells, the third generation solar cells, Dye-sensitized solar cells (DSSCs), is low fabrication than silicon solar cells, environmentally friendly and can be applied to various field. For this reason, the DSSCs have been continuously researched. But DSSCs have one drawback that is the low power conversion efficiency (PCE) than silicon solar cells. To solve the problem, we used the back-reflector the Al foil that can be easily obtained from the surrounding in order to improve the efficiency of the DSSCs. Easily detachable Al foil back-reflector increases the photocurrent by enhancing the harvesting light because the discarded light is reused. It also leads to enhance the power conversion efficiency (PCE). In addition, we compared with the efficiency of the DSSCs that is applied and does not be applied with back-reflector according to the thickness of the TiO2 photoelectrode. When the back-reflector is applied to DSSCs, the photocurrent is increased. It leads to affect the efficiency. We used to solar simulator and Electrochemical Impedance Spectroscopy (EIS) to confirm the PCE and resistance. The DSSCs were also measured by External Quantum effect (EQE). At the same time, FE-SEM and XRD were used to confirm the thickness of layer and crystal structural of photoelectrode.

Keywords: dye-sensitized solar cell, back-reflector

EW-002

Nanoscale NiO for transparent solid state devices

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We report a high-performing nanoscale NiO thin film grown by thermal oxidation of sputtered Ni film. The structural, physical, optical and electrical properties of nanoscale NiO were comprehensively investigated. A quality transparent heterojunction (NiO/ZnO) was formed by large-area applicable sputtering deposition method that has an extremely low saturation current of 0.1 nA. Considerable large rectification ratio of more than 1000 was obtained for transparent heterojunction device. Mott-Schottky analyses were applied to develop the interface of NiO and ZnO by establishing energy diagrams. Nanoscale NiO has the accepter carrier concentration of the order of 1018 cm-3. Nanoscale NiO Schottky junction device properties were comprehensively studied using room temperature impedance spectroscopy.

Keywords: NiO, ZnO, Transparent Conductor, Nanoscale, Photoelectric Devices