Thermally stable Double-layered amorphous-SnO_2/AZO Transparent conducting oxide for Dye-sensitized solar cells

이희상, 우성일*
KAIST
(siwoo@kaist.ac.kr*)

Thin SnO_2 layer was deposited on AZO film by rf magnetron sputtering to improve thermal stability up to 500 °C. The thermal stability was higher when the SnO_2 layer was grown as amorphous phase than crystalline phase. The thickness of amorphous-SnO_2 layer varied from 2.5 nm to 21.8 nm, showing the highest thermal stability with 13.9 nm. To investigate the protective effect according to the thicknesses of SnO_2 layers, the amount of oxygen vacancies in AZO layer was analyzed by XPS spectra of O 1s. The sheet resistance of SnO_2 (13.9 nm)/AZO double-layered film increased by 1.35 times from 4.0 Ω/square to 5.4 Ω/square after annealing at 500 °C in air atmosphere. The average transmittance was 83.4% in the visible region. The transmittance decrement by SnO_2 (13.9 nm) layer was 1.3%. The reason for showing small decrements was due to extremely low thickness of SnO_2 layer. Because the SnO_2 was grown as amorphous phase, it was able to provide good protection against oxygen even though the thickness was very low.