

Thermally stable ZnF₂/Al-doped ZnO double-layered transparent conducting oxide for dye-sensitized and perovskite solid state solar cells

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Aluminum-doped zinc oxide (AZO) has been interested in one of the most candidate transparent conducting oxide (TCO) materials for solar cells. In the case of dye-sensitized or perovskite solar cells, thermal stability of TCOs is required because coating of TiO₂ layer preceded by the deposition of TCO thin film is conducted above the temperature of 400 °C. Unfortunately, electrical properties of AZO deteriorate above the temperature of 300 °C due to annihilation of oxygen vacancies by the adsorbed oxygen, and the formation of AlO_x reacted with diffused Al and oxygen in the surface of AZO. Here we applied ZnF₂ thin film as the barrier layer to protect adsorbing oxygen atoms in the air, and keep good electrical and optical properties of AZO during high temperature process. ZnF₂/AZO double-layered TCOs showed enhanced thermal stability and suitable optical properties for DSSCs or perovskite solar cells after high temperature process in air ambient.