Transmittance and work function enhancement of RF magnetron sputtered ITO:Zr films for amorphous/crystalline silicon heterojunction solar cell

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Recently, TCO films with low carrier concentration, high mobility and high work function are proposed beneficial as front electrode in HIT solar cell due to free-carrier absorption in NIR wavelength region and low Schottky barrier height in the front TCO/a-Si:H(p) interface. We report high transmittance and work function zirconium-doped indium tin oxide (ITO:Zr) films with various plasma (Ar/O₂ and Ar) conditions. The role of (Ar/O₂) plasma was to enhance the work function of the ITO:Zr films whereas the pure Ar plasma based ITO:Zr showed good electrical properties. The RF magnetron sputtered ITO:Zr films with low resistivity and high transmittance were employed as front electrode in HIT solar cells, yield the best performance of 18.15% with an open-circuit voltage of 710 eV and current density of 34.63 mA/cm². The high work function ITO:Zr films can be used to modify the front barrier height of HIT solar cell.

Keywords: ITO:Zr, work function, HIT solar cell, transmittance