Bulk Heterojunction Tandem Photoelectric Cell Based on p-Si and Phthalocyanine

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An organic-inorganic (p-Si and phthalocyanine) hybrid tandem heterojunction Ag/p-Si/AlPc:H₂Pc/ITO photoelectric cell was fabricated by pressing technology using preliminary vapor deposited heterojunction films of mixed aluminum-phthalocyanine (AlPc) and metal free phthalocyanine (H₂Pc) on p-Si substrate and on ITO coated plastic substrate. By keeping organic films face to face both substrates were pressed and fixed together by adhesive at elevated temperature. Total thickness of the AlPc and H₂Pc films were equal to 300 nm. On the back side of p-Si substrate the Ag film was deposited. The device architecture was the following: Ag/p-Si/AlPc:H₂Pc/ITO. The morphology of the organic semiconductors film was investigated by AFM. The optical properties of the AlPc:H₂Pc film were studied by UV-visible spectroscope. Current–Voltage characteristics were measured in dark and also illumination conditions. Under illumination of 296 W/m² the values of V_{oc} , I_{SC} , FF and efficiency were equal to 0.5 V, 4 mA, 0.45 and 0.61 %, respectively. The I - V and P - V characteristics of the solar cell were simulated by using Shockley equation and its Newton Raphson solution, respectively for dark and illumination conditions. The obtained simulated results were in good agreement with the experimental results.

Keywords: pressing-technology; thermal evaporation; organic-inorganic; phthalocyanine; photoelectric cell

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