Improving the Efficiency of TiO2 Thin Film-Based Solar Cells by Changing the P3HT: PCBM Ratio and their Characterization

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Today, the fossil fuels in the world are being depleted; and the tendency to use alternative sources is rising day by day. A small proportion of the energy comes from the solar power. It is caused by the fact that the efficiency of solar cells is very low and they cost more than average. Using polymer with conductibility on the active layer reduces the cost of the organic solar cells. In order to use organic solar cells for practical purposes, it is necessary to improve their efficiency while conducting a study about their reaction to environmental effects and their long-term stability. The most widely used active layer of polymer solar cells is P3HT: PCBM because of their relatively higher efficiency. The yield of ITO/P3HT: PCBM/Al structured solar cells are low. In this research, we altered the structure of regular cells and made inverted ones instead. We produced organic solar cells and made their characterization. After we coated TiO2 thin films, we made an XRD measurement. Then we altered the PCBM ratio as P3HT: PCBM (1:0.6- 1:0.8- 1:1 – 1:1.2) (w/w) while the ratio of P3HT was stabilized. Finally, we coated 50 nm of Ag by using thermal evaporation system. For the characterization process, we obtained current- voltage curves by using a solar simulator. The increment of PCBM in the active layer provided a better efficiency level by increasing the Isc value. (?=1.44 (1:0,6 w/w), ?=2.29 (1:0,8 w/w), ?=2.14 (1:1 w/w), ?=2.43 (1:1,2 w/w). Thus, we obtained the most efficient solar cell with ?=2.43 P3HT: PCBM (1:1,2). Keywords: Organic solar cell, inverted polymer solar cells, P3HT: PCBM active layer, TiO2 layer