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Investigating the Effect of Argon Jet Plasma on the Change ITO Surface Energy in Polymer solar cells

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Abstract

In this project we investigated the performance of inverted organic solar cells with plasma jet-treated indium tin oxide (ITO) as the cathode for omitting an electron transport layer try to increase adhesion and Surface energy of ITO substrate by atmospheric pressure Argon plasma jet. The Ar plasma jet works Out of the chamber and in atmospheric pressure in cold temperature by RF power supply. after this level we able to remove electron transport layer and investigate the effects according to measuring the angle of contact and transparency good results were obtained, the photovoltaic performance was found to be dependent on the applied power of plasma. After applying the plasma on ITO surface morphological changes were also observed and we investigate that with atomic force microscopy (AFM) analyze. Then we fabricated P3HT \ ICBA based inverted polymer solar cells and the highest obtained efficiency was 4.30 %.

Keywords: polymer solar cell, plasma jet, contact angle, Charge carrier

Introduction

Always with the progress of societies and development of various aspects of human life, the energy was the most important concern of scientific circles. Because of exhaustible fossil fuels, scientists ongoing effort for Find new resources of energy in addition to the easy access, also ability to use and reproduction, has many results. Solar energy could be a good alternative, being accessible in everywhere of Earth and reducing environmental pollution are important benefits of solar energy [1].

Polymer solar cells has significant advantages compared to other kind of solar cells including reduce production costs, flexibility and low weight. there is two kind of different structure polymer solar cell, straight and inverted model [2]. In the inverted model polymer solar cell, the place of the two electrodes, cathode and anode is changed [3]. in the both structure for good transmission of charge carriers to electrodes we use hole and electron transport layer [4]. Hole transport layer block electron and Passes the hole and electron transport layer block hole and Passes the electron, this process is based on work function of this materials and in compliance with energy level of charge carriers (figure 1). One of the most common electron transport layer is ZnO[1] and of common hole transport layer is PEDOT:PSS [5].

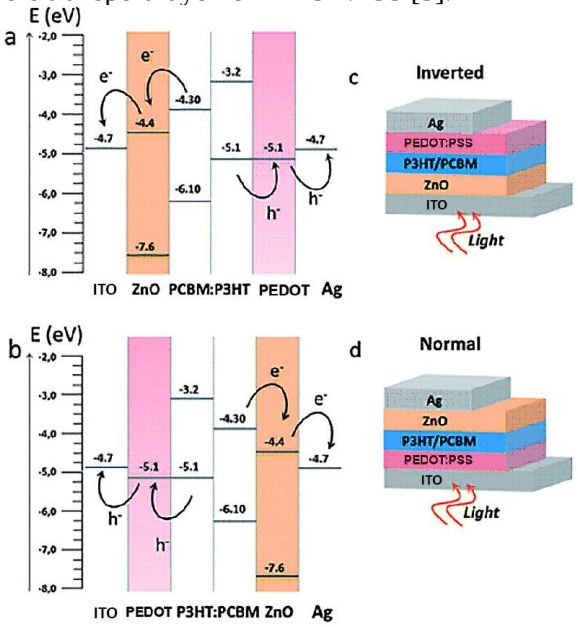

Figure 1. Energy diagram of hole and electron transport layer in inverted and normal solar sell.

Good contact between the layers also is very important to charge carrier transport and decrease series resistance [6]. A charge carrier on the way to the electrodes encountered with Series Resistance and the Series Resistance is maximum in the layers contact surface [7].

[1] Zinc oxide