STUDY ON DOPING TEMPERATURE OF IODINE IN MEH-PPV: I-MWCNTs ORGANIC SOLAR CELL

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ABSTRACT

The performance of nanocomposited poly [2-methoxy-5-(2'-ethylhexyloxy)-(p-phenylene vinylene)] (MEH-PPV) and iodine doped multiwall carbon nanotube (MWCNT) for organic solar cell application were investigated. 120 mg of MWCNTs was first doped with 1 gram of iodine using thermal chemical vapour deposition method (CVD) with temperature varied at 90, 100, 110, 120, 130 and 140^0C. Then, 80mg of MEH-PPV was stirred for 48 hours with tetrahydrofuran (THF). Next, the CNT was added to the solution to form nanocomposited MEH-PPV: I-MWCNT solution. The solution was then deposited on ITO using spin-coating method. The current density – voltage (J-V) were measured in dark and under illumination using solar simulator. Optical properties such as absorbance and transmittance were measured using UV-Vis Spectrophotometer. For physical properties, the characterization was done using Field Emission Scanning Electron Microscopy (FESEM) and Atomic Force Microscope (AFM). From the I-V curve characteristic, thin film with doping temperature of 100^0C gives the best result considering some response it gives towards light. In optical properties, the thin film also gives out the 0.45 unit of absorption spectra which is the highest value among other temperature.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

A nanocomposite is a multiphase solid material where one of the phases has one, two or three dimensions of less than 100 nanometers (nm), or structures having nano-scale repeat distances between the different phases that make up the material. The mechanical, electrical, thermal, optical, electrochemical, catalytic properties of the nanocomposite will differ markedly from that of the component materials.

In the earlier time, there has been a lot of research regarding nanocomposite using polymer of MEH-PPV as one of the main material. A research was done by O. Yangping, W. Yang, Y. Lixin, L. Chunjun, and L. Yuan, [1] with a title of "Organic solar cells with improved spectral coverage based on copper phthalocyanine : MEH-PPV : C_{60} bulk heterojunctions". The goal of the research is to enhance the photo-current of the polymer solar cell based on MEH-PPV by adding copper phthalocyanine (CuPc) in the active layer. The researcher has managed to improve the spectra coverage of absorbance and increase the photo-current but the efficiency for solar cell is still very low. Moreover, the other characteristic such as optical bandgap and fill factor is not investigated and considered.

In addition, previous research of nanocomposite using MEH-PPV and Gallium antimonide (GaSb) has been done by L. Bakueva, S. Musikhin, E. H. Sargent, and S. Schulz [2]. The title of the research is “Infrared absorption and emission in conducting polymer/GaSb nanocomposites”. The research mainly studying the absorption and emission in the infrared region of the nanocomposite. The problems that their faced