Electrical and Optical Properties of Nanocomposites MEH-PPV:CNT Thin Film

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ZULHELMI BIN SERAD

FACULTY OF ELECTRICAL ENGINEERING

UNIVERSITI TEKNOLOGI MARA

40450 SHAH ALAM,

MALAYSIA.

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Zulhelmi Bin Serad
Faculty of Electrical Engineering
Universiti Teknologi MARA (UiTM)
Shah Alam, Selangor Darul Ehsan
Malaysia

ABSTRACT

This paper investigates the electrical and optical properties of nanocomposites MEH-PPV:CNT thin film with different composition ratio of CNT. CNT was prepared using palm oil as precursor and ferrocene as catalyst in the furnace of the ATOMIZER equipment. The thin film was deposited on the glass substrate by using spin coating technique. The influence of composition ratio of CNT on the electrical properties and optical properties of conjugated polymer MEH-PPV was characterized by current-voltage measurement in dark and under illumination, also UV-VIS-NIR spectrophotometer. The current-voltage measurements are show relationship between conductivity and resistivity of thin film. Degree of slope determines resistance and resisivity of the thin film. The conductivity of thin film will be affected by some factor such as thickness and resistivity of thin film. For electrical properties, it was found that conductivity of nanocomposites MEH-PPV:CNT thin films are increasing as increasing composition ratio of CNT. The optical properties of thin film were examined using UV-Vis-NIR spectrophotometer for transmittance, absorption, and optical band gap energy. By using UV-VIS-NIR spectrophotometer measurement show the optical band gap decreases when composition ratio of CNT increases.

Keywords: carbon nanotubes, polymer MEH-PPV, thin films, electrical properties, optical properties

ELECTICAL AND OPTICAL PROPERTIES OF NANOCOMPOSITES MEH-PPV:CNT THIN FILM

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CHAPTER 1

INTRODUCTION

1.1 ORGANIC PHOTOVOLTAIC CELL

An Organic Photovoltaic Cell (OPVC) is a branch of electronics that deals with conductive organic polymers or small organic molecules for light absorption and charge transport. The organic material has several advantages due to low production costs, can be large scale production and flexibility of organic material. By combination of polymer with the flexibility of organic molecules, this makes it potentially lucrative for photovoltaic applications. Molecular engineering like changing the length and functional group of polymers can change the energy gap, which allows chemical change in these materials. The optical absorption coefficient of organic molecules is high, so a large amount of light can be absorbed with a small amount of materials. The main disadvantages associated with organic photovoltaic cells are low efficiency, low stability and low strength compared to inorganic photovoltaic cells [1, 2].

In OPVC, there are several types of junction for OPVC such as single layer OPVC, multilayer OPVC and dispersed heterojunction of OPVC. All of this junction can create different efficiency and application. The difference of work function between the two conductors sets up an electric field in the organic layer. When the organic layer absorbs light, electrons will be excited to conduction band and forms excitons with the holes left in valence band. The electric field is responsible to separate the electrostatic bounds exciton which then pulls electrons to the positive electrode and leaves holes to the negative electrode. The resulting current and voltage from this process generate ideal