UNIVERSITI TEKNOLOGI MARA

A STUDY ON THE ELECTRICAL & OPTICAL CHARACTERISTICS OF MEH-PPV THIN FILMS USING DIFFERENT SOLUTION CONCENTRATION

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ABSTRACT

Polymer and organic light-emitting diodes (OLEDs), photovoltaic cells and field effect transistor are being focused towards commercialization. Poly [2-methoxy-5-(20-ethylhexoxy)-p-phenylene vinylene] or known as MEH-PPV, have been extensively studied for OLED applications. Thin film morphology much dependent on the solution concentration and choice of solvent which come out with different electrical and optical properties. MEH-PPV from two different solvents which are toluene and 1, 2-dichlorobenzene (1, 2-DCB) with varied concentration were prepared in this study. In order to have uniform thin film of MEH-PPV, spin coating technique is applied. The electrical properties of thin film were investigated and the optical properties were characterized by using UV-Visible-NIR (UV-VIS-NIR), Photoluminescence (PL) spectroscopy and Atom Force Microscope (AFM), high-resolution type of scanning probe microscopy. It is found that as the concentration of solution increased, thickness of thin film also increased as well as the resistivity of the thin film. However, MEH-PPV from 1, 2-DCB gives better conductivity compare to Toluene. There also significant difference between Toluene and 1, 2-DCB in PL and absorbance spectra which Toluene exhibit higher peak and more red-shifted compare to 1, 2-DCB.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Over the past several years, organic light emitting devices (OLEDs) have become a very attractive field for application in large-area flat panel and flexible displays due to their easy and low cost fabrication, wide-viewing angle and low energy consumption [1–4]. Polymers and other certain organic molecules have been favorable material for a remarkable progress in developing application of organic light-emitting diodes (OLEDs), photovoltaic cells, and field effect transistor since the discovery of its conductivity.

OLEDs are semiconductor devices composed of at least one undoped organic layer that is sandwiched between two electrodes that act as anode and cathode. Electrons and holes are injected from cathode and anode respectively. Both carriers will drift towards the other side in the applied electric field as a voltage is applied at positive and negative terminal. Recombination process occurs when both electrons and holes meet at the interface to form excitons that will decay to produce light emission through glass substrate. The basic construction of OLED can be seen in Figure 1.1. The emissive layer of organic molecules is where electrons transport from cathode while conductive layer transport holes from anode.