UNIVERSITI TEKNOLOGI MARA

ELECTRICAL AND OPTICAL PROPERTIES OF NANOCOMPOSITE MEH-PPV:ZnO PREPARED AT DIFFERENT COMPOSITION

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Abstract

Research on organic based light emitting diode (OLED) has become current interest due to high potential as flat panel displays. OLED is form by a layer of organic compounds sandwiched between two electrodes. In this study, the compound that has been selected for OLED application is nanocomposite MEH-PPV:ZnO. The preparation of MEH-PPV and nanocomposite solution was done using toluene as the solvent. Nanocomposite MEH-PPV:ZnO thin films were deposited using spin-coating method. The objective of this paper is to find the optimum parameter of nanocomposite MEH-PPV:ZnO thin films for OLED application by preparing the thin films using different composition ratio. The electrical and optical properties have been observe for nanocomposite MEH-PPV:ZnO thin films. The electrical characterization was investigated for the conductance behavior of the thin films. By adding more compound of ZnO to the thin films, the conductivity was improved due to the increasing of carrier concentration. For optical measurement, there are two characterizations were applied which electrical and optical characteristics. The electrical properties were analyzed using 2-probe Current-Voltage (I-V) measurement system (Advantest R6243). For optical, Ultraviolet-Visible (UV-Vis) spectrophotometer and Photoluminescence (PL) spectroscopy were used. From the electrical results, it shows the composition ratios of MEH-PPV:ZnO nanocomposite give the inversely proportional relation to the resistivity which related to the carrier concentration. The optical measurement found that the quenching of luminescence with the presence of ZnO. This is due to the attributed of reduction in the emissive materials.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In this paper, presented an electrical and also optical study of nanocomposites composed of Zinc Oxide (ZnO) nanoparticles and poly [2- methoxy-5-(20-ethyl hexyloxy)-phenylene vinylene] (MEH-PPV). ZnO and MEH-PPV were chosen because these two materials are widely studied for their intriguing optoelectronic properties. In a type II heterojunction between a polymer and a wide band gap semiconductor such as the MEH-PPV:ZnO system, electrons can diffuse unimpeded from the polymer to the semiconductor. As the polymer is illuminated with photons of energy larger than the band gap, electron–hole pairs are generated. The electrons are injected into the conduction band of the semiconductor and can move along the nanoparticle network, ultimately being collected via an electrical contact in photovoltaic devices. The nature of the charge transfer process depends on the optical properties of two materials as well as the surface properties of the nanoparticles. The present study focuses on the luminescence properties of the MEH-PPV:ZnO nanocomposite and the energy transfer between the polymer and the nanoparticles. Application of ZnO in optoelectronics device has also shown a growing interest due to its high electron mobility and wide band gap; it is also a low-cost and