EFFECT OF POLYVINYLPYRROLIDONE (PVP) COATING ON THE OPTICAL EMISSION OF ZnO MICRORODS GROWN VIA HYDROTHERMAL METHOD

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ABSTRACT

Coating with polyvinylpyrrolidone (PVP) altered the optical emission of ZnO microrods grown via hydrothermal method. The initially broad defect emission decreased in intensity and was resolved into green and red emission bands after coating. This result suggests that PVP can potentially be used to target particular defect emissions of ZnO.

Keywords: ZnO, hydrothermal method, polymer coating, photoluminescence

INTRODUCTION

With its wide bandgap and large exciton binding energy, zinc oxide (ZnO) can exhibit ultraviolet (UV) emission at room temperature, making it a potential material for UV lasers [1-4]. Aside from UV emission, ZnO can also emit visible emission because of intrinsic and extrinsic crystal defects [5]. This further allows ZnO to be used in other applications such as visible light-emitting devices, energy conversion, and fluorescence labeling [6-8]. The study and control of ZnO emission is thereby useful in the development of wide-ranging applications. Therefore, different post-synthesis treatments are being studied to alter the optical emission of ZnO. Such treatments include annealing [9,10], plasma treatment [11,12], and coating of ZnO surface with surfactants or polymers [13,14]. In this study, ZnO synthesized using hydrothermal method was coated with polyvinylpyrrolidone (PVP). The PVP polymer can chemically adsorb to ZnO surfaces due to its polar structure [15], and the interaction between PVP molecules and the ZnO surface can result to modified optical emission of ZnO. This paper presents the effect of PVP coating on the room-temperature photoluminescence properties of ZnO microrods grown via the hydrothermal method.