UNIVERSITI TEKNOLOGI MARA

SYNTHESIS OF ZINC OXIDE NANOPARTICLES WITH BANANA PEEL EXTRACT FROM MUSA ACUMINATA PLAINTAIN (PISANG TANDUK): EFFECT ON PH VALUE AND REACTION TIME

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ABSTRACT

The zinc oxide nanoparticles (ZnO NPs) is synthesized using *Musa Acuminata Plaintain* banana peels extract (BPE). This synthesis is considered an ideal method for synthesis as it is using biodegradable material which are cost-effective and easily to access. Effect of the pH value and reaction time on the morphology of the ZNP were studied. The characterization of the synthesized ZNP is analyzed using Fourier Transform Infrared Spectroscopy (FTIR), X-Ray Diffractometer (XRD), Ultraviolet Visible (UV-Vis), Brunauer-Emmett-Teller (BET), Zeta Potential and High Performance Liquid Chromatography (HPLC). The XRD pattern shows that the ZnO NPs have a crystalline hexagonal wurtzite structure. The band gap energy is found in the range of 3.28-3.41 eV. The optimum condition for the synthesis of the nanoparticles are found at pH 12 and reaction time of 60 minutes.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Nanotechnology has become one of the promising researches in the last decades. This is due to the fact that nanotechnology would able to provide resolutions in many fields especially in biomedicine, material science, optics as well as electronics. (Król, Pomastowski, Ra, & Buszewski, 2017) In the research of nanotechnology, nanomaterials are closely related as it considered as the key of the research. Nanomaterials are the particles with nanoscale dimension where it provides a large surface area to volume ratio due to its very small sizes. (Agarwal, Kumar, & Rajeshkumar, 2017) There are various type of nanomaterials such as metallic nanoparticles, metal and non-metal oxides, semiconductor nanoparticles and carbon nanoparticles. (Król et al., 2017)

Among the nanomaterials, metal oxides nanomaterial has gained a lot of attraction compared to others. This is due to the properties of the metal oxides itself where they exhibit a high fraction of atoms and were able to attract such properties of antimicrobial, magnetic and catalysis. (Vijayakumar, Mahadevan, Arulmozhi, Sriram, & Praseetha, 2018) Zinc oxide (ZnO), titanium dioxide (TiO_2) and ferrous oxide (Fe_3O_4) are the common examples of metal oxides. Amid of these examples, Zinc oxide nanoparticles are the most studied due to its wide range of application in different industry. Zinc oxide possess a physico-chemical property and have a wide band gap energy also a high excitation energy. These properties enables it to withstand large electric fields, high temperature and high power operations. (Naveed et al., 2017)

In the current research, green technology are highly demanded, therefore the synthesis of the zinc oxide using the natural products such as vitamins, sugars, plant extracts and biodegradable polymers are highly encouraged. (Jime, 2013) Therefore, banana peels have been chosen as the model sample in this research. In fact, the use of these natural products comes with many advantages apart from environmentally friendly as it also a cost effective materials and has a high rapidity. (Vijayakumar et al., 2018)