UNIVERSITI TEKNOLOGI MARA

SYNTHESIS OF ZINC OXIDE NANOPARTICLES WITH BANANA PEELS EXTRACT (BPE) FROM MUSA ACUMINATA (PISANG ABU): EFFECT ON PRECURSOR CONCENTRATION AND REACTION TEMPERATURE

NURUL HAFIZAH BINTI ROSLI

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ABSTRACT

Synthesis of metal oxide nanoparticles has been one of the most active research under nanoscience and nanobiotechnology especially when it is related to green technology. This green synthesis method is considered as alternative in synthesizing zinc oxide nanoparticles (ZnO NPs) which environmentally friendly among other synthesizing method which does not involve any toxic chemicals, possessed a strong adsorption ability and exhibits high catalytic efficiency. This research focusing on the studies on synthesizing of ZnO NPs by using Musa Acuminata (Pisang Abu) peels extract as a reducing agent. In the synthesizing procedure, zinc acetate dehydrate was used as precursor solution and sodium hydroxide to adjust the pH of the banana peels extract and zinc acetate dehydrate mixture. The concentration of the zinc acetate dehydrate and the reaction temperature of the procedure were varied from 0.01M – 0.2M and 50^{o}C – 90^{o}C respectively. The synthesized ZnO NPs were characterized using Fourier Transform Infrared Spectroscopy (FTIR), UV-Visible Spectrometer (UV-Vis), Brunauer-Emmett-Teller (BET), Zeta-Potential, High-Performance Liquid Chromatography (HPLC) and X-Ray Diffraction (XRD). The band gap energy was found in the range of 3.28 – 3.45 eV meanwhile the XRD analysis confirmed the hexagonal wurtzite structure for the ZnO NPs with average particles of 14 to 17 nm. HPLC data showed an existence of ZnO NPs in the synthesized samples meanwhile BET analyzer confirming ZnO NPs particles sizes at range of 40 -110 nm. Lastly, Zeta-Potential result show the particles size for the samples exceeds the average nanoparticles size which is more than 100 nm. This confirms the banana peels used in the synthesized on ZnO NPs is suitable to be used as the reducing and capping agents.

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INTRODUCTION

1.1 RESEARCH BACKGROUND

Nowadays, the synthesize of metal oxide nanoparticles has been one of the most active research under nanoscience and nanobiotechnology. The uses of the zinc oxide are widely used in the society where many industrial manufacturing processes including paints, cosmetics, pharmaceuticals, plastics, batteries and others. In the worldwide, 45% from the production of zinc oxide is used in the rubber industry to control the vulcanization process and as additive (Joel & Badhusha, 2016). In the pharmaceutical industries, ZnO is applied in ointments because of its antiseptic properties (Joel & Badhusha, 2016).

The use of plant extract in the study has been one of the attractions for the scientist to do further research of using of plant in the synthesis of metal oxide. The plants extract seems to be the best candidate and it is suitable for large scale of biosynthesis of nanoparticles. According to Ramesh, the uses of plant in the research are much more stable and the rate of synthesis is faster than that in the case of other organisms (P. Ramesh, 2014).

Furthermore, when it is involved with green synthesis method which more effective compared to other method. The synthesis of zinc oxide nanoparticles exhibits high catalytic efficiency, strong adsorption ability, high isoelectric point, biocompatibility and fast electron transfer kinetics for biosensing purposes (Muthu Chudarkodi R.R. & A., 2016)