UNIVERSITI TEKNOLOGI MARA

CHARACTERIZATION OF OIL PALM LEAVES AND EFFECT OF PH VARIATION ON SOL-GEL SYNTHESIS OF ZINC OXIDE USING OIL PALM LEAVES

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July 2017

ACKNOWLEDGEMENT

Alhamdulillah, all praises to the almighty god, Allah S.W.T for the countless goodness that are given to me and all the required necessity to complete this project.

I would also like to express my thanks and gratitude to Mrs. Rabiatul Adawiyah Binti Abdol Aziz, my supervisor of this project for all her endless supports, valuable ideas and guidance throughout the project from the beginning until the end. I would also like to show my sincere appreciation to Faculty of Chemical Engineering for the facilities provided and for the permission for me to use the equipments and apparatus in the FKK Laboratory and all the valuable information provided by the lab assistants.

Sincere gratitude for all of my friends for sacrificed their time to assist and guide me to succeed despite of their busy schedule. Their compliments and critics had helped me most in keeping me focused on to my project and to finish in time. Also thanks for their kindness to share their knowledge on the software.

Special thanks to my beloved parents and my loved ones for all their loves and encouragement to excel in this project. Thanks for their continuous support through all the hard time and for the dream they had for me.

I am grateful to express my sincere appreciation to all my lecturers and my fellow undergraduates members for their kindness to provide assistance and shared all the useful knowledge they had with me to complete this project.

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ABSTRACT

Zinc oxide is one of the most used nanoparticles globally these days. ZnO can be classified in the group of inorganic metal oxides that comprises a wide range of nanostructures. This research is focusing on the application of ZnO as the material for manufacturing food packaging. Production or synthesis of nanoparticles can be achieved by different methods. Some of the routes such are associated with environmental pollution. These problems lead to finding an alternative that can ensure a cleaner and safer route for synthesizing Zinc Oxide. Thus, using plant extract as reducing agents for synthesizing the nanoparticles provide more safe and convenient making it becoming the most preferred methods as they are clean and cost effective. Oil palm leaves was selected as the material for biosynthesis of ZnO nanoparticles because of its availability in this country as it generated as the by-product of palm oil. Thus, as for the aim of this study, characterization of the oil palm leaves must be done to study the zinc and other minerals contents of the oil palm leaves using ICP-OES and FTIR analysis. Green Sol-gel method is chosen as the method for synthesizing ZnO and to study the effect of pH variation to the properties of ZnO by using XRD and FTIR analysis. The FTIR analysis for the both leaves extract liquid and powder shows peak at 3316.09 and 3296.12 cm-1, respectively. This alcohol O-H stretching group indicates that the leaves extract has the similar hydroxyl bond with alcohol that makes it suitable for alcohol substituent for ZnO synthesis. The ICP-OES data confirms the presence of Zinc component in the leaves that indicates the compatibility of oil palm leaves for synthesizing of ZnO. The ZnO was synthesis at different pH. From FTIR analysis of the ZnO, it can be confirmed there was presence of ZnO in the precipitate as shown in the peak of the range 800-900 cm-1 for all variation of ZnO. It also confirms that indeed the pH of the solution does affect the properties of the synthesized ZnO. The XRD analysis shows that average size increasing from 15.19 to 20.51 nm as the pH of the solution increases from 7 to 12. The composition analysis of XRD exhibits that only at pH 12 the ZnO produce is in pure form.

CHAPTER 1

INTRODUCTION

1.1 Research Background

Nanotechnology especially nanoparticles plays a major part in science fields including chemistry, physics, biology and material sciences. These nanoparticles have spread its application throughout the globe and give certain amount of impact to various industries involving in manufacturing. Production or synthesis of nanoparticles can be achieved by different methods; chemical, physical, irradiation and biological (Bhumi and Savithramma, 2014). Some of the routes such as hydrothermal, sol-gel synthesis, micro emulsion methods and precipitation method are associated with environmental pollution and contamination (Ochieng, et al, 2015). In the light of recent research, many green synthesis method of producing nanoparticles that provides a clean, safe, eco-friendly and environmentally nontoxic is commonly applied (Bhumi and Savithramma, 2014).

Zinc Oxide is one of the common nanoparticles that are used widely in industry. Zinc Oxide can be classified in the group of inorganic metal oxides that comprises a wide range of nanostructures (Parthasarathy, et al, 2016). Zinc Oxide (ZnO) nanoparticles have high level of antibacterial activity against high temperature and pressure resistant organisms such as spore (Nicole et al., 2008). This ability of ZnO makes it applications in