UNIVERSITI TEKNOLOGI MARA

SILVER NANOPARTICLES SYNTHESIS USING PINEAPPLE WASTE

SYED MUHAMMAD ZULFAZLI
B. SYED OMAR

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ABSTRACT

Nanoparticles is one of the new technology in this century. This technology help human being to control the behaviour of material at molecular level. There are three methods to produce nanoparticles physical method, chemical method and biological method. Biological method is more preferred from other two methods because it is eco-friendly, safe and low operation cost. Usually, plant parts or microorganism is used as raw material in biological synthesis. However, plant part is preferred to use because it is easy to handle than microorganism. Waste from plant part is suggested instead of fresh part because it can reduce the operation cost and reduce the waste produced. Abundant of pineapple wastes is an example of plant part that has potential in the biological method. Waste from pineapple which is peel was studied in the potential of nanoparticle material. This study was undergone four simple steps which are extraction process, synthesis process, purification stage and analysing stage. Firstly, pineapple peel was extracted to get the biomolecule. The peel extract solution was analysed using Fourier transform infrared spectroscopy (FTIR). The peel extract has biomolecule such as protein, Bromelain and vitamin C was verified by using FTIR. Thus, peel extract was used as reducing and capping agent to prepare silver nanoparticles, the process is called biological method. Then, it was added into silver nitrate solution and the mixture was stirred. The colourless of silver nitrate solution was changed to the dark brown solution after peel extract was added. After that, the dark brown solution or called as silver nanoparticles was analysed by using Ultraviolet-visible (UV-vis) instrument. The absorbance peak of UV-vis spectrum in range of 400 nm to 500 nm shows there is silver nanoparticles in that solution. Then, the solution was analysed by using FTIR to verify the changing of the functional group. Silver nanoparticles solution was dried to get the power form. Then, it was further characterized by using Field Emission Scanning Electron Microscopy (FESEM). The size of AgNPs was formed in a range from 25 nm to 37 nm. The size of silver nanoparticles was formed in the range from 25 nm to 37 nm that conducted using biosynthesis at 10 minutes stirring, 0.01 M of 500 ml $AgNO_3$ and room temperature. As a conclusion, the peel extract has potential in the synthesis of nanoparticles and the formation of nanoparticles can be controlled by manipulating the volume ratio, stirring time and $AgNO_3$ solution concentration.

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TABLE OF CONTENT

CHAPTER 1

INTRODUCTION

1.1 Research Background

Nanotechnology is one of the new technology in this century. On 29 December 1959, a foundation of nanotechnology was declared by the father of nanoparticle who is the physicist, Richard Feynman at American Physical Society meeting at the California Institute of Technology. He had given probability that who know this technology can be able to manipulate and control a process at atomic and molecule level. A modern nanotechnology was born after a machine which is able to detect and see the Nanoscale range (NSET).

An object of size in 1- 100 nm range is referred to as nanoparticle material. The size of the nanoparticle is different and depends on their bulk material. In order to maintain and stabilised the size of the nanoparticle, some capping agent is added during the process. Nowadays, variety type of metallic nanomaterial are being explored and produced using copper, zinc, gold, silver etc. Different types of metallic nanoparticle material will be used in different purpose due to their incredible properties. Nanoparticles have been applied in medical treatment, energy production, environment, agriculture etc (Hasan, 2015).

The nanoparticle can be synthesised in two approaches which are top to bottom and bottom to up as shown in Figure 1.1. These two approaches have their own advantages and limitations. Top to bottom approach has only one method which is the physical method. This method converts the large size of the material to small size. It is used the mechanical machine like chemical etching, thermal (laser ablation) and sputtering. Bottom to up approach consists of two methods which are the chemical and biological method.