# BIOSYNTHESIS AND CHARACTERIZATION OF GOLD AND SILVER NANOPARTICLES BY PINK GUAVA *(PSIDIUM GUAJAVA)* WASTE EXTRACT

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# 1. Letter of Report Submission

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Y.Bhg.Prof,

**FINAL RESEARCH REPORT "BIOSYNTHESIS AND CHARACTERIZATION OF GOLD AND SILVER NANOPARTICLES BY PINK GUAVA *(PSIDIUM GUAJAVA)* WASTE EXTRACT"**

Referring to the above matter, attached herewith is the 4 copies of final research reports and a CD entitled " Biosynthesis and Characterization of Gold and Silver Nanoparticles by Pink Guava *(Psidium Guajava)* Waste Extract" by our group of researcher from Faculty of Chemical Engineering, UiTM Cawangan Pulau Pinang for your kind attention.

Thank you,

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## 5.2 Enhanced Executive Summary

There is an increasing commercial demand for nanoparticles due to their wide applicability in various areas such as electronics, catalysis, chemistry, energy and medicine. Metallic nanoparticles are traditionally synthesized by wet chemical techniques, where the chemicals used are quite often toxic and give impact to the human health and environment. Metal nanostructures have unusual physicochemical properties and biological activities compared to their bulk parent materials. In this study, silver and gold nanoparticles (AgNPs and AuNPs) were synthesized from aqueous silver nitrate and auric acid solution respectively, through a simple and eco-friendly route using pink guava waste extract (PGWE) as reductant and stabilizer. The resulting silver and gold nanoparticles were characterized by using Ultraviolet-visible (UV–vis) spectroscopy, Fourier transform infrared (FTIR) spectroscopy and transmission electron microscopy (TEM). AgNPs and AuNPs vary in size according to different amount of PGWE and silver nitrate and auric acid concentration used for the synthesis. Formation of AgNPs and AuNPs was confirmed by the color changed and by surface Plasmon spectra by using Uv-Vis spectrometer as well as absorbance peaks lie between 400 to 500 nm. The silver and gold nanoparticles obtained using this source have particles size in the range of 0- 50 nm. It was found that the increase in silver nitrate and auric acid concentration leads to the increasing size of AgNPs and AuNPs produced.

## 5.3 Introduction

Nanotechnology is look forward to be the basis of many of the main technological innovations of the 21st century. Research and development in this field is maturing rapidly throughout the world. A major output of this activity is the development of new materials in the nanometer scale, including nanoparticles. These are usually defined as particulate materials with at least one dimension of less than 100 nanometers (nm), even the particles could be zero dimension as in the case of quantum dots. Metal nanoparticles have been of great interest due to their distinctive features such as catalytic, optical, magnetic and electrical properties (Bar *et al.*, 2009). A number of methods including physical and chemical methods (Yu, 2007), electrochemical reduction (Liu and Lin, 2004), photochemical reduction (Vorobyova *et al.*, 1999) and heat evaporation (Smetana *et al.,* 2005) have been used for the synthesis of silver and gold nanoparticles (AgNPs, AuNPs). However, simple and more greener procedures for the synthesis of AgNPs and AuNPs will be advantageous, without accumulating a gigantic quantity of toxic and unneeded chemicals in solid, liquid and gaseous form in the environment (Parashar *et. al.,* 2009). Processing of fruits produces two types of waste; for instance, a solid waste of peel/skin, seeds, stones and so on while a liquid waste of juice and washwaters. In some fruits the discarded portion can be very high. Consequently, there is often a serious waste disposal problem, which can lead to problems with flies and rats around the processing room, if not correctly deal with. If there are no plans to use the waste it should be buried or fed to animals well away from the processing site. So far there is no report on the development of silver and gold nanoparticles by utilizing pink guava waste extract. In this study a simple and rapid green synthesis of AgNPs and AuNPs using pink guava waste extract have been reported. Silver and gold nanoparticles can be prepared with lower amounts of pink guava waste extract and without any additional chemicals/and or physical steps. The effect of pink guava waste extract quantity and concentration of metal solution were also evaluated to optimize the synthesis route producing the metal nanoparticles.