

UNIVERSITI TEKNOLOGI MARA

**SYNTHESIS OF PLATINUM
NANOPARTICLES USING PALM
LEAVES EXTRACT AS REDUCING
AGENTS**

NUR AFIQAH BINTI ARHAM

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ABSTRACT

Platinum are mainly used as excellent catalyst for oxidation and hydrogenation processes in petrochemical industry. The conventional physical and chemical methods of synthesis platinum nanoparticles are not only energy intensive, because of severe conditions, but also environmentally unfriendly, due to the use of toxic solvents or additives. Therefore biological synthesis of nanoparticles is always preferred since biological method is easier than the other methods, ecofriendly and less time consuming especially the biosynthesis methods which utilizes plant extracts. The plant phytochemicals with antioxidant or reducing properties are usually liable for reduction of metal compounds into nanoparticles. Hence the purpose of this research to extract reducing agents from palm leaves through water-based extraction method and used the palm extract to synthesis platinum nanoparticles. The effect of metal salt concentration and plant extract percentage on platinum ions conversion and the size distribution of the platinum nanoparticles were studied. The conversion of platinum ions was determined by atomic absorption spectroscopy (AAS). A greater conversion of platinum ions to nanoparticles was achieved by employing 10% of palm leaves extract with 1mM of H_2PtCl_6 . The platinum nanoparticles were characterized by fourier-transform infrared spectroscopy (FTIR), transmission electron spectroscopy (TEM) and energy-dispersive absorption x-ray spectroscopy (EDX). FTIR showed revealed that compounds such as hydroxyl, carbonyl and amine groups act as reducing agents for platinum ions reduction. EDX confirmed the presence of platinum element. The TEM result showed that platinum nanoparticles of less than 5nm size have been synthesized by reduction of H_2PtCl_6 using palm leaves extract at room temperature.

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CHAPTER ONE

INTRODUCTION

1.1 RESEARCH BACKGROUND

The field of nanotechnology is one of the most attractive research areas these days. Nanotechnology is defined as research and development which include the synthesis, characterization, exploration and application of nano-sized materials (1-100 nm) [1].

The prominence of nanotechnology is depended on the fact that properties of substances vividly change in physical, chemical and optical properties when their size is reduced to the nanometer range. The individual particle was found to have unexpected properties when the bulk material is dispersed into small size particles [2]. It is known that atoms and molecules have totally different behaviours than the bulk materials. Therefore, nanoparticles are offering many new developments in the fields of biological sciences, chemical industry, cosmetics and others.

Two major approaches for the synthesis of nanomaterials are Top-down method and Bottom-up method [3] as shown in Figure 1. The Top-down method (Figure 1.1) is a process in which the bulk materials are reduced to smaller particles while the Bottom-up method (Figure 1.1) is a technique in which different ions are aggregated to form materials of nanometer range [4]. Different method such as physical vapour deposition (PVD), laser vaporization (ablation) method, chemical synthesis method and others have different approaches depending upon the application of the nanoparticles [5].