UNIVERSITI TEKNOLOGI MARA

ELECTROSPRAYING OF GOLD NANOPARTICLES

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ABSTRACT

Synthesizing of gold nanoparticles were conducted by reversing the order of reagents through citrate reduction method. Monodispersed of gold nanoparticles were hard to be obtained by using classical method likes dripping, continuously and progressively. Therefore, electrospraying technique had been introduced and applied in this research due to its advantages. Dispersion of hydrogen tetrachloroaurate solution into the reaction bath containing reductor trisodium citrate dihydrate solution are conducted using the fore mentioned above technique. Molar ratio of citrate to chloroaurate were changed and their effects on the size, distribution, dispersity and stability of particles were investigated. The colloidal gold particles were characterized by Zeta-Sizer and UV-Visible spectroscopy. The size of gold nanoparticles formed decreases from 11.2 nm to 4.8 nm with increasing in the dispersity of the particles as the molar ratio increases. Electrospraying approach turned out to be an effective method in synthesizing Au nanoparticles as this method produces highly homogenous formation of nanoparticles compared to the other method as well as this approach have the ability to produce very small particles(droplets) with narrow size distribution due to charged droplets which limits the aggregation of the particles.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

Synthesizing of gold nanoparticles can be prepared through various methods such as Turkevich method, Brust-Schiffrin method and Martin(I) method. Each method offers different size of formation of gold nanoparticles in terms of size by using different reductor and stabilizer. In this research project, the focus is on the synthesis of gold nanoparticles (AuNPs) by citrate reduction method which is proposed by Turkevich through reversing the addition of reagents. Electrospraying technique is applied in the preparation of these particles. Characterization of the gold nanoparticles in terms of size, distribution, dispersity and stability of particles is performed by using Zeta-sizer and UV-Visible Spectroscopy.

1.1.1 Gold Nanoparticles

Research on the nanoparticles have been increasing over the last few decades. Properties of nanoparticles which depends on the size have led many researchers to conduct research on this matter. These nanoparticles have caused confusion among the researchers which perceived common understanding of these nanoclusters as separate and intermediate state of matter (Iqbal et al., 2016).

Gold nanoparticles is one of the nanotechnology approach. It has a unique physical, magnetic, electronic, optical and biomedical properties. Due to this, gold nanoparticles have been applied in a broad variation of assortments like medicine and optics (Hedkvist, 2013). Ability of gold nanoparticles in interaction with visible light have made these particles being applied in labelling application. Excitation of free electrons in gold atoms occur when these particles interact with light. These excitation lead to resonant oscillation known as surface plasmon resonance (SPR). The gold nanoparticles will then be able to absorb and dispersed visible light which depends on the shape, size and agglomeration state (Iqbal et al., 2016). Therefore, it can be concluded that nanoparticles properties depend on the size of the particles. Thus,