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CHARACTERIZATION OF CARBON DOTS PASSIVATED WITH POLYETHYLENE GLYCOL USING UV SPECTROSCOPY AND ELECTRON MICROSCOPY

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ABSTRACT

Recently, carbon dots has drawn wide attention of reseachers around the globe with their amazing properties such as great fluorescence properties, can be used in bioimaging aspect, non photobleaching, low toxicity and high stability. This research project is focused on the synthesis of carbon dots and its characterization using ultra-violet visible spectroscopy, transmission electron microscopy and scanning electron microscopy.

Activated charcoal was used to prepare carbon dots by nitric acid reflux. The carbon dots that synthesized were characterized using UV spectroscopy, transmission electron microscopy and scanning electron microscopy. UV spectrum revealed the peak between 220nm and 320nm which indicates the presence of carbon dots. Transmission electron microscopy and scanning electron microscopy images shown carbon dots have average sizes less than 10nm and smooth surface respectively.

Passivation with different types of polyethylene glycol produced different effect on absorbance of carbon dots. UV spectroscopic proves the effect of auxochrome which causes hyperchromic effect that is increase the UV absorbance of carbon dots when passivated with different type of polyethylene glycol.

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CHAPTER 1

INTRODUCTION

1.1 Background of study

Carbon dots(CD) are fluorescent carbon nanoparticles(FCN) is 2 – 6nm in size. These carbon dots are used in many fields of cellular imaging, biosensing and drug delivery because of low toxicity, good hydrophilicity and photoluminescence properties(Yang, Peng, Zong, & Zhu, 2013). It is nano-crystalline with graphitic structure and produce luminescence under UV exposure(Ray, Saha, Jana, & Sarkar, 2009 which is an alternative biosensor of semi-conductor quantum dots since discovered in 2004.

There are many methods to synthesize carbon dots such as high energy ion beam radiation in diamond particle, laser ablation of graphite followed with oxidation and functionalization, thermal decomposition, electrooxidation of graphite and oxidation of candle soot with nitric acid(Ray, Saha, Jana, & Sarkar, 2009). In addition, CD can be also synthesised from activated charcoal.

CD has significant properties which can be used as biosensing or detector. CD is now getting wide attention from researchers worldwide due to its ability of producing photoluminescent, good biocompability, good stability, inexpensive, low toxicity compared to quantum dots which used using heavy metals which can raised serious health and environment concerns(Qiao *et al.*, 2010). Besides that, CD is easy to synthesis. CD also can be act as probe such as histone-CD probe which can be used as clinical diagnostics for dengue(Maiti, Das, & Das, 2013).