UNIVERSITI TEKNOLOGI MARA (UiTM)

PUNCAK ALAM

# EFFECT OF POLYETHYLENE GLYCOL (PEG) LENGTH ON THE FLUORESCENCE INTENSITY OF CARBON DOTS

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# ABSTRACT

Carbon dots (CD) are luminescent nanoparticles that can be used to track biological processes inside cells. They are less toxic than similar alternatives, making them more suitable for use in live biological systems, but the light-emitting properties of those currently made are not ideal. CD is one of the recent substance that are being used as a tools for bio-imaging probes. Fluorescent CD-based imaging probes have becoming a new medical diagnostic tools due to its advance labelling technology. One of its characteristics is superior brightness and photo-stability. Besides that, the usage of carbon nanoparticles is safe as it is non-toxic which is suitable for biological staining and diagnostics. In this research, the factors affecting fluorescence intensity of CD was investigated by treating the CD by via surface passivation method. The objective of this study is to find an optimum amount of surface passivating agent i.e. polyethylene glycol (PEG) required to produce maximum fluorescence spectra. It has been concluded that as the length of PEG used in the passivation method increases, the fluorescence intensity of CD was enhanced.

# CHAPTER 1: INTRODUCTION.

## 1.1- OVERVIEW.

Carbon is has been known in medicinal technology as a useful compound capable to interact with cellular components. The abundance of carbon is high as it can be freely found from environment, soot, organic compound and also cellular components as well as from the soil. In health technology, carbon are synthesised into carbon nanoparticles, carbon nanotubes and quantum dots (Maxwell, Taylor, & Nie, 2002).

Carbon nanoparticles have a diameter of lower than 10 nm. They are used for the application of bio-labelling due to their stable photoluminescence property, drawing the attention of researchers in the field of medical nanotechnology (Hu *et al.*, 2013). CD-based quantum dots are very attractive semiconductor materials which show excellent superiority in biological imaging. Photo-luminescent carbon dots are superior than semiconductor quantum dots in terms of toxicity, (Yang, Penmatsa, Tajima, Kawarada, & Wang, 2009), brightness and photo-stability. Besides that, the usage of carbon nanoparticles is safe as it is non-toxic, rendering them suitable for biological staining and diagnostics (Maiti, Das, & Das, 2013).

The fluorescence intensity of carbon nanoparticles depends on the types of chemical used for the surface passivation of the carbon nanoparticles itself. One of the popular surface passivating agents is polyethylene glycol (PEG). Therefore, observation can be made whether there are increment or decrement of photo-