CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME IV

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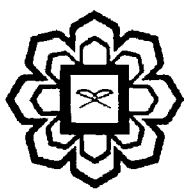

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CHAPTER 14

OPTIMUM COLLOIDAL DISPERSION OF CARBON NANOTUBE IN ETHYLENE GLYCOL USING TRITON X-100 AS DISPERSING AGENT

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ABSTRACT

Stable homogenous dispersions of carbon nanotubes (CNTs) in ethylene glycol can be prepared by using the surfactant Triton X-100 (TX-100) as the dispersing agent. This study attempts to determine the stability of homogeneous colloidal dispersion of carbon nanotubes (CNTs) in ethylene glycol with and without the surfactant. It is known that TX-100 can be used as the dispersing agent to improve the dispersions of CNTs in ethylene glycol. The sample solutions are prepared with a total mass of 20 g of CNT and TX-100 with varying concentration (in wt %) of CNT, and TX-100. UV-vis spectrophotometer is used as a measurement device to quantitatively characterize the colloidal stability of the dispersions with respect to the sedimentation time while homogenization and sonication is used as a method of producing a homogenous dispersion. This study proposes that a particular concentration (in wt %) of Triton X-100 applied to a given concentration of CNT is the key parameter affecting the stability of the homogenous dispersions.

Keywords: CNT dispersion, ethylene glycol, nanofluid stability

INTRODUCTION

The stability of the nano-suspensions is very important in preparation of heat transfer fluid. However, to produce a stable homogeneous dispersion of these nano-suspensions with CNTs is a challenge due to the fact of aggregation of CNTs in the base fluid. Similarly, due to high surface energy of nanoparticles which is attributed by van der Waals interactions, it is easy for these nanoparticles to coagulate and as a result, they are difficult to disperse in base fluid. Therefore, controlling the coagulation of CNTs in the nanofluids has become the primary issue for the initial research of nanofluids. It is also important to investigate dispersion and stability of nanofluids in order to exploit their potential benefits and applications. Thus, various studies are being conducted to focus on the production of a stable homogeneous colloidal dispersion of CNTs using variation of fractions of surfactant as dispersing agents.

Carbon nanotubes (CNTs) have attracted an enormous attention over the past decade because of their unique electronic, thermal, optical, and mechanical properties. These versatile properties of CNTs offer a wide variety of potential applications such as field emission devices, electrochemical devices and nanotube-based composites or thin films (Lee *et al,*