CHAPTER I

INTRODUCTION

1.1 Background

Currently, an increase in energy consumption and release of pollutants from fossil fuel combustion have aroused us to find other alternative energy. There are a number of alternative energy sources, such as hydroelectric, hydrogen and solar, energy considered as promising choices. Solar energy has been received more interest because of its environmental friendly and free source. So far, there have been widespread efforts using amorphous silicon solar cell for extracting solar energy. In 1980, dye sensitized solar cell has firstly been developed by Michale Gratzel. The dye sensitized solar cell is now the most popular solar cell because its theoretical maximum efficiency is up to 33%. Besides, the dye sensitized solar cell is easy to produce and the cost of fabrication is low (O'Regan et al., 1991). To the best of our knowledge, the maximum efficiency of dye sensitized solar cells was reported (Nazeeruddin et al., 2005) was 11.18%. It is still insufficient for actual utilization Many researchers have attempted to improve the efficiency and to reduce the resistance. One of the factors responsible for the drop in efficiency is mesoporous titanium dioxide, in electrode of dye sensitized solar cell ,which is the bridge for electrons transfer from dye to conductive glass (Ito et al., 2007; Gratzel et al., 2003),.

The titanium dioxide are currently introduced to improve the efficiency (Lao et al., 2004;Hsiao et al., 2006; Pavasupree et al., 2008).

Carbon nanotubes (CNTs) are considered as a good material with an excellent properties, such as stronger than steel, higher hardness than diamond and higher conductivity than silver. Carbon nanotubes also play a role in charge carrier transport material because of its excellent conductivity (Xia et al., 2007; Shanmugharaj et al., 2007; Batra et al., 2006, Wang et al., 2005; An et al., 2007). So, carbon nanotubes can help electron transport from dye to conductive glass easier which can cause of increasing current density. The carbon nanotubes with high stability should be treated with acid to form a carboxylic group on their surface, which could possible better dispersion (Datsyuk et al., 2008).

In this research, the screen print technique has been used to prepare electrode (Tsoukleris et al., 2005) which could be prepared by adding composites of titanium derivatives and carbon nanotubes The suitable condition for preparing titanate nanotubes (TNTs) and rice-shaped TiO_2 were obtained to preparing these powder. The titanate nanotubes produced by the hydrothermal method are introduced in this research (Ma et al., 2006; Yang et al., 2003). TNTs were used as precursor for second step preparing rice-shaped TiO_2. TNTs and rice-shaped TiO_2 have been developed to increase their specific area (Ou and Lo, 2007), corresponding to the increase in their active site. Thus, these can provide more absorption area for dye in receiving solar energy (Argazzi et al., 2004; Lai et al., 2007). The composites were characterized their surface area and pore volume by Brunanuer-Emmett-Teller surface analyzer(BET), morphology by TEM and phase by X-ray diffraction.

After fabrication of dye sensitized solar cell, their performance will be checked using IV measurement. To the best of our knowledge, incorporation of TiO_2 and CNTs for solar energy application has been an emerging issue which will provide a new contribution to global energy problem.

1.2 Objectives of study

- To synthesize and characterize the composites of CNTs – titanium derivatives by hydrothermal method.
- To study the Effect of types of composite to dye sensitized solar cell efficiency.

1.3 Scopes of Research

1. Investigation and characterized of modified CNTs
2. Preparation of TNTs and rice-shaped TiO_2
3. Preparation of CNTs-titanium derivatives composites by hydrothermal mixing method.
4. Preparation of electrodes of dye sensitized solar cell by using the composite
5. Fabrication of dye sensitized solar cells and checking their performances

1.4 Expected Benefits

- Find the optimum ratio of the composite in preparation of dye sensitized solar cell
- Improve the efficiency of DSSC by adding synthesis material
- Enhance the efficiency of new kind material for reducing the pollutant from other source energy