CHAPTER I

INTRODUCTION

Currently, there are many types of battery, and among of them lithium ion battery (Li-ion battery) is one of the most popular batteries. It is worked by the electrochemical reaction process, can be rechargeable, and has a wide variety of shapes, light weight, and high open circuit voltage (low self-discharge). Similar to others, Li-ion battery is consisted of three components, viz. anode, cathode, and electrolyte. The anode of a conventional Li-ion battery is made from carbon while the cathode is a metal oxide, and the electrolyte is lithium salt in an organic solvent. The performance of the Li-ion battery depends on the choice of the material for anode, cathode and electrolyte. Therefore, the design of the material for those three components has been continuously studied.

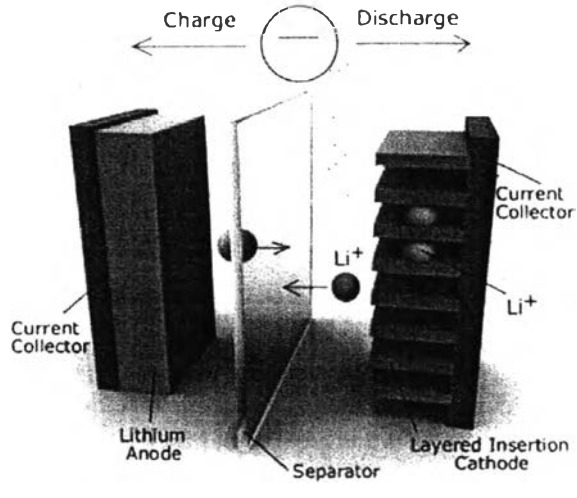

Figure 1.1 Schematic of Li-ion battery.

There are many factors that are affecting the performance of the Li-ion battery. For example, the battery is surrounded with high temperature because the traditional carbon anode produces heat, has poor cycle time at high current application, high internal resistance, and low safety, etc. Therefore, the composition and surface area of the electrode material impact the properties of the Li-ion battery (*Besenhard JO, 1999*).

There are many types of conventional electrode materials that have been done to improve these problems. Several companies are also working with manganese spinel (AB_2X_4) and lithium iron phosphate cathodes with carbon anode. These systems can increase the safety. Another interesting material is lithium titanate anode that gives fast charge/discharge and good cycle life. However, the compositions, synthesized technique, such as solid-state method, sol-gel method etc., and the properties of electrode material must be further developed.

This research is thus focused on the synthesis of a suitable material for the electrode. The material chosen and studied in this research is copper-indium-tin mixed oxides ($CuInSnO_4$) to hopefully enhance the insertion of lithium for Li-ion battery application (*Dedryve`re et al, 2000*). Sol-gel method, followed by electrospinning technique, was selected to form nanofibers with higher surface area. The conditions of the synthesis were investigated and the properties of the product, including phase, structure, and surface area, were characterized.