CHAPTER I
INTRODUCTION

Energy storage devices (accumulators) are the device that is able to store some form of energy and can be drawn upon at a later time to perform some useful operation such as battery, capacitor and fuel cell. The accumulators have become a dominant factor in economic development because they are the power source for electronic device, digital telecommunication system, electrical vehicle and UPS (uninterruptible power supply).

Although commercial accumulators are important devices but they have been of limited use in power source systems, especially capacitor and battery, due to small capacity, short durability, high cost and toxic waste.

Supercapacitors are new kind of electrical storage energy devices, which can store much more energy than conventional capacitors and offer much higher power density than battery. They are based on carbon materials (activated carbon, carbon black, aerogel particulates, carbon cloth) and have been attracting much attention because of their high performance, low cost and environmentally friendly

Carbon aerogels, which are highly porous materials consisting of a continuous rigid solid framework and an open, continuous network of pores, represent a promising and innovative materials because of their attractive properties such as a high electrical conductivity (25-100 S/cm), controllable pore structure, high porosity (80-98%) and highly useable surface area (up to 1100 m^2/g), which make carbon aerogels very suitable for application as the supercapacitor. Although carbon aerogels have excellent properties but the cost of production is more expensive because of their preparation method which usually include supercritical drying.

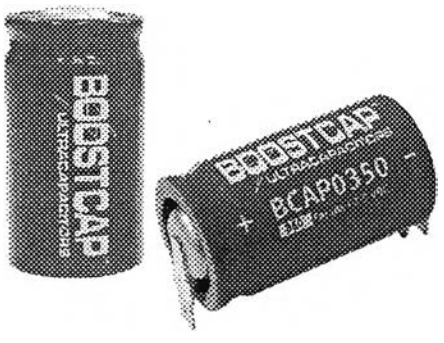

Figure. 1.1 Supercapacitors (http://www.rise.org.au/info/Tech/scap/index.html).

Traditionally, carbon aerogels can be prepared through the polycondensation of resorcinol and formaldehyde using acid or base as a catalyst. Polybenzoxazine, an innovative high performance thermosetting resin, exhibits numerous excellent properties including low water absorption and high dimentional stability. Due to its molecular design flexibility, the properties of polybenzoxazine can be tailored to accommodate any desired applications. Moreover, this material can be synthesized by using the method recently discovered by our research group which enables a faster and easier approach to a conventional benzoxazine synthesis method. The carbon aerogel prepare from polybenzoxazine can get different characteristic surface area by designing pore size such as changing concentration and changing type of precursors of benzoxazine.

The proposes of this work are to reduce the production cost of carbon aerogels by ambient drying process and use polybenzoxazine, the new high performance thermosetting resin, to prepare carbon aerogeles and to study the potential ability of polybenzoxazine derived carbon aerogels as electrodes for supercapacitors.