CHAPTER I

INTRODUCTION

Nowsaday, porous materials have been extensively studied and used in various applications such as water purification, gas separation, catalytic support, electrode material for energy stroage devices, thermal insulator, etc. Generally, porus structure can be classified into three types according to the IUPAC; microporous (<2nm), mesoporous (2-50 nm) and macroporous (> 50 nm). One of the porous materials that is currently in high demand is porous carbon. Not only because its excellent properties such as light weight, high surface area, high porousity, high thermal stability, high char yield and low density, but also its availability. (Chaisuwan *et al.*, 2011)

Many materials have been used as percursors for synthesis of porous carbon material, particularly, resocinal-formaldehyde (RF). But, using this has some drawbacks which are multi-step to complete the process, needed of harsh catalyst for polymerization and releaseing by-product during polymerization. (Pekala *et al.*, 1989) In this work, polybenzoxazine (PBZ) was used as a precursor to synthesis carbon precursor. Polybenzoxazine can overcome drawbacks of RF polymer because of its easier preparation, no need of harsh catalyst for polymerization, no volatile of toxic by-product released during polymerization.

Porous carbon has been prepared by many processes: for example; hard-templating method, emulsion, surface templating, etc. But, some methods produce broad pore-size distribution which might not be appropriate for the application that requried selective pore size. In order to control the pore structure, template synthesis method which can be classified into two types; hard-templating and soft-templating, has been investigated. (Liang *et al.*, 2004)

The hard template required multi-step as follows; (a) the prerarationof a porous template with control porosity; (b) the impregnation of suitable carbon precursor by wet impregnation or chemical vapor deposition or a combination of both methods, (c) polymerization and carbonization of carbon precursor to generate an

organic/inorganic composite, (d) removing the inorganic template such as silica by using acid (HF) or base (NaOH) to obtain porous carbon. During the template removing process, the porous carbon must withstand several harsh processes such as high-temperature treatment and strong acid or base (NaOH/HF), which usually reconstructed the pore structure causing the pores to become disorder. (Xia *et al.*, 2010)

So, an alternative approach is the soft-templating synthesis by using surfactant. Soft-templating has many advantages such as easy to control the pore structure, less steps to prepare, no hazardous chemical involved, etc. (Li *et al.*, 2012)

In this work, we aim to design and control the pore structure of porous carbon by using soft-template to obtain high surface area, or nanosphere carbon and studying the effect of synthesis parameters such as solvent, concentration of surfactant, pyrolysis and activation temperature on the microstrcture of the resulting porous carbon.