# CHAPTER I
# INTRODUCTION

Carbon-supported catalysts are generally used in chemical industry. The most widely used support is activated carbon, although carbon black or graphite is sometimes considered. Comparing with other types of supports, such as alumina and silica, zeolites; carbon materials have many advantages: (i) they are stable in acid or basic media; (ii) they are resistant to high temperature; and (iii) the metal when used as a catalyst can be recovered easily after burning the support. For some types of carbons, their porous texture can easily be tailored, yielding high surface-area supports where the active phase can be well dispersed with the required pore-size distribution to facilitate the diffusion of reactants and products to, and from, the active phase (RodrõÂguez-Reinoso *et al.*, 1986) Since they are also relative chemically inert, thus, prevent harmful metal-support interactions. Carbons have been utilized as a support for a number of active phases, including noble metals (Neri *et al.*, 1995), base metal (Bischoff *et al.*, 1995), and also metal compounds, such as sulfides and oxides (Drago *et al.*, 1995).

Carbon aerogels are a novel porous carbon material that has received considerable attention over the past decade (Pekala *et al.*, 1989). These materials can be obtained from the carbonization of organic aerogels prepared from the sol–gel polycondensation of certain organic monomers, such as resorcinol and formaldehyde, following Pekala's method (Pekala *et al.*, 1992). These carbon aerogels can be obtained in the forms of beads, powders or thin films. Their unique properties, viz. well controlled micro- and mesoporosity, and a large surface area, make them promising materials for application in adsorption and catalysis. Basically, carbon aerogels are a network structure of interconnected nanosized primary particles. In regard of their porous structure, micropores are related to the intra-particle structure whereas mesopores and macropores are produced by the inter-particle structure (Yoshizawa *et al.*, 2003) The porous structure of carbon aerogel is obtained by solvent removal through supercritical drying process in order to prevent pore collapse. However, this method is impractical for industrial scale production.

Polybenzoxazine (PBZ) provides high thermal stability, low shrinkage upon polymerization, no by-products or volatile generation, excellent dimensional stability, and rich molecular design flexibility. In addition, the supercritical drying process is not necessary due to high crooslink density of polybenzoxazine (Ishida *et al.,* 1996) Porous cabon obtained via ambient drying method is called carbon xerogel. Polybenzoxazine is a great candidate as a polymer precursor to produce carbon xerogel to be used as a material support.

In this study, carbon xerogel derived from polybenzoxazines were developed as a catalyst support. Its performance as a catalyst support for biodiesel upgrading through partial hydrogenation process was compared with the results in which activated carbon was used as a support. The photocatalytic degradation of 4-nitrophenol by using $TiO_2$ as a catalyst on carbon xerogel was also investigated in comparison with the synthesized porous $TiO_2$ in which carbon xerogel was used as a template.