CHAPTER I
INTRODUCTION

Gas sensors made from polymer composite thin film have already shown their potential ability as sensing elements in commercial electronic noses (M.C Burl *et al.*, 2002). The simplicity of signal transduction and the low material cost of the detector make them attractive. The principle of composite polymer vapor sensors is basically to exploit the gas absorption properties of an insulating polymer whose electric properties are modulated by the conductive filler. The response of the sensor to an analyst is measured as a change in the resistance of the sensor. As the analyst diffuses into the polymer composite, the polymer swells, causing the dispersed conductive fillers to move farther apart from each other, resulting in a decrease of the conductivity or an increase of the resistance which can be detected by the sensor (X. Chen *et al.*, 2000).

In this study we fabricated and characterized gas sensors with a new type of filler called "carbon aerogel" from polybenzoxazine based precursor using polydimethylsiloxane (PDMS) as the polymer matrix. Carbon aerogel (CA) is a novel nano-sized porous carbon material with highly cross-linked structure. They have been applied in many aspects, such as electrode materials for supercarpacitors and rechargeable batteries, adsorbents, chromatographic packing, advanced catalyst support, environmental protection, and so on, due to their properties of low mass density, a large amount of mesopores, high surface area and high-electrical conductivity (R.W.Pekala *et al.*, 1989).

Generally, carbon aerogel can act as both conductive filler and molecular sieve that allows certain type of gas to pass through the carbon aerogel containing thin film [14]. Carbon aerogel has greater advantages over the activated carbon because the porous structure of carbon aerogel can be tailored for desired applications (R.W.Fu *et al.*, 2003). On the other hand, carbon nanotube is expensive; hence, the filler is not appropriate for commercial applications at the moment (B.Philip *et al.*, 2003).