

## Preparation of carbon membranes for gas separation

### Introduction:

Polymeric membrane materials were recognized as a promising tool for gas separation. However, these polymer membranes are deficient to meet the requirements of membrane technology, especially operation at high temperature and harsh environment. In the recent decades, membrane materials based on carbon material have served as an alternative candidate for various types of gas separations. Carbon membrane is an inorganic membrane, which can be fabricated by using thermosetting polymer. The concept of carbon membrane or film for gas separation can be traced back to the early 1970s. These membranes were prepared by compressed nonporous graphited carbon into a plug (hence the name 'carbon membrane') [1]. Carbon membranes have excellent thermal and chemical stability, compared to polymeric membranes commercially available in the industry. Besides, they can also attain high selectivity without losing the productivity and thus surpass the upper bound limit of polymeric membranes [2–5]. At present, carbon membrane materials have become more important in the new era of membrane technology for gas separation and liquid–liquid phase separation due to their higher selectivity and permeability, stability and hightemperature operations, and well-defined stable pore structure. In addition, unlike polymeric membranes, carbon membranes are usually durable and capable of withstanding adverse and rigorous environment because of their high thermal and chemical resistance. Carbon membranes demonstrate attractive characteristics among molecular sieving materials such as excellent shape selectivity for planar molecule and high hydrophobicity. It is, however, more feasible to form carbon molecular sieve membranes (CMSMs) [6–8]. These characteristics have stimulated interest among researchers in the early 1980s to further investigate the separation characteristics of these membranes. Recently, carbon membranes have also been found to be very useful materials in the preparation of nanofiltration [9], pervaporation [10], and microfiltration membrane [11]. This chapter addresses the important aspects of carbon membrane fabrication in view of preparing a good-quality carbon membrane for gas separation processes.