

## CHAPTER I

### INTRODUCTION

Membrane separation technique is a technique commonly used to replace distillation, extraction, absorption and adsorption. In the past decade, there is much attention emphasized to develop the zeolite membrane technology because inorganic membranes can overcome the limitation of chemicals, thermal and mechanical instability of polymeric membranes.

NaA zeolite membrane synthesized on the surface of a porous  $\alpha$ -Al<sub>2</sub>O<sub>3</sub> support is commonly used to dehydrate water/alcohol mixture because of its hydrophilicity and small pore size. Zeolite NaA membrane was produced using in-situ membrane growth or secondary (or seed) growth technique. By the in-situ membrane growth technique, the support surface is directly contacted with alkali solution containing zeolite precursors, followed by hydrothermal conditions. Under an appropriate condition, nucleation of zeolite crystal occurs on the support, followed by the growth to form a continuous layer over the support. For the secondary growth technique, zeolite crystals deposited on the support surface are exposed to hydrothermal growth condition. There is seed layer before hydrothermal synthesis, resulting in continuous membrane and preventing the NaA zeolite transformation to other type of zeolites.

Zeolite NaA membrane can be synthesized by either microwave hydrothermal or conventional hydrothermal technique. For the microwave technique, the synthesis needs shorter time, gives narrow zeolite particle size distribution and highly pure product. However, using short time for synthesis, the growing of crystallite gives hemisphere-shape, not fully cubic shape, and the layer may not be well completed, resulting in any pinholes if synthesis time is not high enough.

The aim of this study is therefore to synthesize the NaA zeolite membrane by microwave technique and study the effect of synthetic parameters on the as-synthesized membranes to understand how the crystals grow. Another word, the study is focused on the growth mechanism of NaA zeolite by comparing between static and dynamic methods. Moreover, the comparison of the NaA membrane

synthesis on  $\alpha\text{-Al}_2\text{O}_3$  support by using different technique, conventional hydrothermal treatment , electrophoresis technique and microwave hydrothermal treatment.