

CHAPTER I

INTRODUCTION

The speech “There’s a plenty of room at the bottom” was from the Nobel Prize winner physicist named Richard Feynman in 1959 who started to drive scientific community towards the new fields of research. To these days, thousands of people have studied in this well-known field called “Nanotechnology”. The nanotechnology itself is the combination of science and technology used to study or manipulate things in the range of 0.1 to 100 nanometers in at least one dimension (The U.S. National Nanotechnology Initiative). This opens to many possibilities to develop new types of materials which have novel properties and to improve properties of existing materials.

The discovery of carbon nanotubes (Iijima, 1991) has brought an attention toward one-dimensional nano structured materials because of their novel physical properties and potential applications. Titania nanotubes have also gained interest due to their superior applications, including photocatalysis (Hoffmann *et al.*, 1995), dye-sensitizing solar cell (Adachi *et al.*, 2003), hydrogen sensing (Varghese *et al.*, 2003), and waste water purification (Oh *et al.*, 2008).

Several techniques were applied to synthesis titania nanotubes, such as Hoyer (1996) used porous aluminum oxide as a template to assist the formation of titanium oxide nanotube structure while Kasuga *et al.* (1998) reported a sol-gel process of fine TiO₂ based powders with NaOH aqueous solution. A year later a chemical process was published (Kasuga *et al.*, 1999). Gong *et al.* (2001) also reported electrochemical anodic oxidation of pure titanium sheet in an aqueous hydrofluoric acid solution. Recently, Wu *et al.* (2005) made a success in reducing reaction time to just 90 min using microwave irradiation.

The purpose of this work is to synthesize titania nanotubes by microwave irradiation, to determine structural difference between titania nanotubes with and without sodium content in the structure. Preliminarily photocatalytic study of the synthesized titania nanotubes was also conducted.