

國立交通大學
材料科學與工程研究所
碩士論文

二氧化鈦奈米棒及奈米管之合成機制與特性研究

Formation Mechanism and Characterization of Titanium Dioxide
Nanorods and Nanotubes



研究生：張珮盈

指導教授：黃華宗博士

中華民國九十四年七月

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研究生：張珮盈

Student：Pei-Ying Chang

指導教授：黃華宗博士

Advisor：Wha-Tzong Huang

國立交通大學

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A Thesis

Submitted to Department of Material Science and Engineering
College of Engineering
National Chaio Tung University
in partial Fulfillment of the Requirements
for the Degree of Master
in Material Science and Engineering
July 2005
Hsinchu, Taiwan, Republic of China

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摘要

本論文主要是針對二氧化鈦一維奈米材料，奈米棒和奈米管之生成機制與一些特性探討。A 部分為探討二氧化鈦奈米棒，二氧化鈦奈米棒是以微乳液法所合成出來的，合成出來的二氧化鈦奈米棒屬於 Anatase 晶體。由 TEM 照片來看二氧化鈦奈米棒長度約 20nm，直徑約 3nm。B 部分為探討二氧化鈦奈米管，二氧化鈦奈米管是以水熱法來合成，合成出來的二氧化鈦奈米管為 Anatase 晶體。由 SEM 照片看到二氧化鈦奈米管之管長大約數微米，由 TEM 照片來看二氧化鈦奈米管內徑約 13nm，外徑 30nm。本論文使用 X 光繞射光譜、吸收光譜、拉曼散射光譜、紅外線光譜、熱分析儀、電子顯微鏡來了解反應動力學、相變化、合成機制與光學性質。

Formation Mechanism and Characterization of Titanium Dioxide Nanorods and Nanotubes

Student : Pei-Ying Chang

Advisor : Wha-Tzong Huang

Department of Material Science and Engineering

National Chiao Tung University

Abstract

This work studied the formation mechanism and characterization of the titanium dioxide nanorods and nanotubes. Part A was the study of the titanium dioxide nanorods. The titanium dioxide nanorods which were anatase crystals were synthesized by microemulsion. The length and the diameter of the titanium dioxide nanorods were 30nms and 3nms, which was showed by the TEM images. Part B was the study of the titanium dioxide nanotubes. The titanium dioxide nanotubes which were anatase crystals were synthesized by hydrothermal method. The length of the titanium dioxide nanotubes were several micrometers, that was indicated by the SEM images. The inner diameter and total diameter of the titanium dioxide was 13nm and 30nm, that was revealed by the TEM images. We used the x-ray diffraction patterns, absorption spectra, raman spectra, FT-IR spectra, thermal analytic spectra and electric microscopes to understand the chemical kinetics, phase transformation, formation mechanism and optical properties.