

# Contents

<b>Abstract ( Chinese )</b> .....	<b>I</b>
<b>Abstract ( English )</b> .....	<b>II</b>
<b>Contents</b> .....	<b>III</b>
<b>Figure Captions</b> .....	<b>IV</b>
<b>Table Captions</b> .....	<b>IX</b>
<b>Chapter 1 Introduction</b> .....	<b>1</b>
1.1 Preface.....	1
1.2 Motivation.....	4
<b>Chapter 2 Fundamental Theories</b> .....	<b>6</b>
2.1 Structures of Carbon Nanotubes.....	6
2.2 The Methods of Carbon Nanotubes Synthesis.....	9
2.2.1 Arc-Discharge Methods.....	9
2.2.2 Laser Vaporization.....	10
2.2.3 Chemical Vapor Deposition.....	12
2.3 The Application of Carbon Nanotubes.....	13
2.3.1 Transistors.....	14
2.3.2 Atomic Force Microscope, AFM.....	14
2.3.3 Field Emission Display, FED.....	16
2.4 Theory of Field Emission.....	19
2.4.1 Field Emission from Metals.....	19
2.4.2 Field Emission Form Semiconductors.....	20
2.4.3 Fowler-Nordheim equation for a single-cell gated FEA.....	21
<b>Chapter 3 Experimental Details</b> .....	<b>24</b>
3.1 Catalyst Preparation.....	24
3.1.1 Solution Deposition Method.....	24
3.1.2 Sol-Gel Method.....	25
3.2 Growth of Carbon Nanotubes.....	25

3.3 Characterization of materials.....	27
3.3.1 Scanning Electron Microscopy, SEM.....	27
3.3.2 Transmission Electron Microscopy, TEM.....	27
3.3.3 Raman Spectroscopy.....	29
3.3.4 Field Emission Measurement.....	29
<b>Chapter 4 Results and Discussion...32</b>	
4.1 Solution Deposition Method.....	32
4.1.1 Pretreatment Time of Hydrogen Plasma.....	32
4.1.2 Effect of Methane Concentration.....	32
4.1.3 Effect of Total Flow Rate.....	35
4.1.4 Effect of MPCVD Power.....	38
4.1.5 Effect of Growth Time of Carbon Nanotubes.....	38
4.1.6 TEM Analysis of Carbon Nanotubes.....	40
4.1.7 Field Emission characteristics.....	41
4.2 Sol-Gel Method.....	50
4.2.1 Pretreatment Time of Hydrogen Plasma.....	50
4.2.2 Effect of Methane Concentration.....	50
4.2.3 Effect of Growth Time of Carbon Nanotubes.....	55
4.2.4 Effect of MPCVD Power.....	55
4.2.5 TEM Analysis of Carbon Nanotubes.....	56
4.2.6 Field Emission Characteristics.....	56
<b>Chapter 5 Conclusions.....65</b>	
5.1 Solution Deposition Method.....	65
5.2 Sol-Gel Method.....	65
<b>References.....67</b>	