

Table of Contents

Abstract (Chinese)	i
Abstract (English)	ii
Acknowledgments	iv
Table of Contents	v
List of Tables	viii
Figure Caption	ix
<i>Chapter 1 Introduction</i>	<i>1</i>
1.1 Introduction of Polarizing Beam Splitter (PBS)	1
1.1.1 Wollaston Prism	1
1.1.2 MacNeille Polarizer	2
1.2 Brief Review of Sub-Wavelength Grating (Zero-Order Grating)	3
1.3 Brief Review of Nanoimprint Technology	5
1.4 Motivation and Objective of this Thesis	7
1.5 Organization of this Thesis	7
<i>Chapter 2 Principle</i>	<i>8</i>
2.1 Introduction	8
2.2 EMT by Average Weighting Method	9
2.2.1 Effective Refractive Index n_{TE}	10
2.2.2 Effective Refractive Index n_{TM}	11
2.2.3 Properties of n_{TE} and n_{TM}	12

2.3	EMT by Bloch Solution Method	13
2.3.1	Effective Refractive Index n_{TE}	13
2.3.2	Effective Refractive Index n_{TM}	16
2.4	Summary	17
 Chapter 3		
	<i>Fabrication Technologies and Instruments</i>	18
3.1	Introduction	18
3.2	Electron Beam Lithography (EBL) Technology	18
3.3	Interferometric Lithography	20
3.4	UV-nanoimprint Lithography Technology	22
3.5	Fabrication Process of Sub-wavelength Grating	24
3.5.1	Fabrication Process of Master Mold (I) --- by E-beam Lithography	24
3.5.2	Fabrication Process of Master Mold (II) --- by Interferometry	26
3.5.3	Fabrication Process of Replicated PDMS Mold	28
3.5.4	Fabrication Process of Sub-Wavelength Grating by Using UV-nanoimprint Lithography Technology	30
3.5.5	Oblique E-beam Evaporation	32
3.6	Measurement System	33
3.6.1	Scanning Electron Microscope (SEM)	33
3.6.2	Atomic Force Microscope (AFM)	34
3.6.3	Optical Efficiency Measurement Setup	36
 Chapter 4		
	<i>Simulated Results</i>	38
4.1	Introduction	38
4.2	Design of the Proposed Sub-wavelength Grating	38

4.3	Period Effect	40
4.4	Surface Profile Effect	43
4.5	Tolerance Analysis of Thickness Inaccuracy of Each Grating	45
4.6	Summary	48
Chapter 5	<i>Experimental Results and Discussion</i>	49
5.1	Introduction	49
5.2	Results of Master Mold	49
5.2.1	Interferometric Lithography --- Sample I	50
5.2.2	E-beam Lithography --- Sample II	51
5.3	Results of Replicated PDMS Mold	52
5.4	Results of UV-nanoimprint Lithography	54
5.5	Results of Oblique E-beam Evaporation	58
5.6	Evaluated Results	61
5.7	Discussion	63
5.8	Summary	64
Chapter 6	<i>Conclusion and Future Work</i>	65
Reference	68