## **Table of Contents**

Abstract (Chinese)
Abstract (English)
Acknowledgments
Table of Contents
List of Tables
Figure Caption

Chapter 1	Introduction	1
1.1	Introduction	1
1.2	Optical data storage	1
1.3	Design issues in light path and pickup system	3
	1.3.1 Media substrate	3
	1.3.2 Optical path in rewritable system	4
	1.3.3 Tracking and focusing servo	7
1.	4 The development of pickup head miniaturization	8
	1.4.1 Micro-opto-electric-mechanical-system (MOEMS) technology	••
		8
	1.4.2 Waveguides and holographic (diffractive) components	9
	1.4.3 Planar pickup based on glass substrate light guide1	0
	1.4.4 Free-space three dimensional micro pickup1	2
1.5	Objective1	4
1.6	Organization of this thesis1	4
Chapter 2	Fundamental Optics for DVD Pickups1	5
2.1	Introduction to basic optics15	
22	Coometrical antics	

	2.2.1 Spherical aberration20
2.3	Diffraction limit21
2.4	DVD specification24
2.5	Optimization procedures25
2.6	Summary
Chapter .	3 Micro Fabrication Processes29
3.1	Introduction
3.2	Reflow29
	3.2.1 Fabrication procedure29
	3.2.2 Focal length estimation30
3.3	Gray Tone Mask34
	3.3.1 Projection printing34
	3.3.2 Mask Design35
3.4	Conclusion
Chapter	4 Reflow objective lens39
4.1	Introduction39
4.2	Fabrication issues39
4.3	Design tradeoff
4.4	Simulation results of objective in ZEMAX44
4.5	Conclusion45
Chapter .	5 Diffractive objective lens47
5.1	Introduction
5.2	Aspheric Lens48
5.3	Fresnel Lens
	5 3 1 Diffractive 51

5.3.2	Surface relief of Fresnel lens	53
5.4 Harmo	onic diffractive lens5	55
5.4.1	Direct sliced objective lens	.55
5.4.2	Hybrid aspheric harmonic objective lens5	8
5.4.3	Tolerance analyses of harmonic lens for gray-scale lithography.	••
		.64
5.5 Conclu	usion	70
Chapter 6 C	onclusion	.72
6.1 Conclu	usion	72
6.2 Integra	ation of the objective lens	73