Contents

中文摘要 …… **i**

英文摘要 …… **iii**

誌謝 …… **v**

Contents …… **vi**

Table Contents …… **viii**

Figure Contents …… **ix**

Chapter 1 Introduction…… **1**

1.1 Photonic Crystal…… 1

1.2 Photonic Band Gap…… 3

1.3 Scope and Outline …… 7

Chapter 2 Theoretical Framework…… **11**

2.1 Maxwell Equation…… 12

2.2 Periodicity of Dielectric Function…… 14

2.3 Bloch Theorem for Periodic Structure…… 15

2.4 Dielectric Function…… 17

2.5 Mode Field Calculation…… 22

Chapter 3 Photonic Band Gap of Two-dimensional Photonic Crystals with Broken Structural and Rotational Symmetries…… **25**

3.1 Air Rods with Triangular Lattice…… 28

3.2 Dielectric Rods with Square Lattice…… 31

3.3 Effects of Deformed and Rotational Symmetries on Band Structures…… 34

3.4 Effect of Anisotropic Materials on Band Structure…… 37

Chapter 4 The Formation of Photonic Band Gap in a Two-dimensional Square Lattice of Dielectric Rods in Air… 52

4.1 The Dielectric Function of Polygonal Structure…… 53

4.2 Photonic Band Gap in a Two-dimensional Square Lattice of Polygonal Dielectric Rods in Air…… 55

4.3 Photonic Band Gap in a Two-dimensional Square Lattice of Corner-cutting Dielectric Rods in Air…… 59

Chapter 5 Effects of Photonic Crystal Band Gap on Rotation and Deformation of Hollow Te Rods in Triangular Lattice… 76

5.1 Dielectric Function of Hollow Structure…… 77

5.2 Effect of Deformed symmetry of Hollow Structure on Band Structures…… 79

5.3 Effect of Rotational Symmetry of Hollow Oval Structure on Band Structures…… 84

Chapter 6 Summary 105

Reference 108