

Contents

Introduction	1
1. Diffraction Gratings realized in Composite Materials	5
1.1. Thin and thick gratings	6
1.2. Holographic Diffraction Grating	11
1.3. Optical Holographic Setup	13
1.4. POLICRYPS holographic gratings	15
1.5. Comparison between H-PDLC and POLICRYPS gratings.....	18
2. In-Situ Optical Control and Stabilization of the Curing	
Process of POLICRYPS Gratings	22
2.1. Setup stability testing	24
2.2. Piezo feature analysis	26
2.3. Feedback algorithm.....	31
2.4. Experiment	34

3. Tunable guided wave components using Polycryps

holographic gratings	39
3.1. Tuneable Optical filters	40
3.2. Bragg grating filter.....	42
3.2.1. Coupled mode equations.....	43
3.2.2. Solution of coupled mode equations	44
3.2.3. Reflection spectral response of Bragg grating.....	47
3.2.4. General properties of waveguides.....	49
3.2.5. Coupled of modes with a grating	54
3.3. Ion Exchanged Glass waveguide.....	60
3.4. A Waveguided Tunable Bragg Grating Using Composite Materials.....	62

4. Realization of periodic and uniform structures for colour

separating backlights	69
4.1. Liquid crystal displays	70
4.2. Colour separating backlight: principles	71
4.3. Optical holographic setup.....	75
4.4. Stability checks	76
4.5. Realization of the samples	81
4.6. Grating structures realization	85
4.7. Optical characterization.....	89
4.8. Optimising grating structures for colour-separating backlight	91
4.9. Large area grating obtained with a step and repeat process	95
4.10. Colour separating backlight experiments	99

Conclusions 104

Bibliography 106

Publications 110