

# Contents

Kurzzusammenfassung .....	i
Abstract .....	ii
Thesis Outline .....	iii
List of Abbreviations Used Within This Work .....	iv
 <b>1 Introduction</b>	
1.1 Multiphoton Absorption .....	1
1.2 Principles of Photopolymerization .....	3
1.3 Two-photon Polymerization (2PP) Technique .....	5
1.4 Materials for 2PP Processing .....	10
1.5 Current Development Status and Applications of 2PP Technique .....	15
1.6 Photonic Crystals – Engineering the Propagation of Light .....	18
 <b>2 Materials and methods</b>	
2.1 Experimental Setup for 2PP Processing .....	22
2.2 Materials Applied for 2PP Processing.....	23
2.3 3D Structure Replication by UV-micromolding .....	27
 <b>3 Results and discussions</b>	
<u>3.1 Investigations of 2PP Process</u>	
3.1.1 Hybrid Organic-Inorganic Materials for 2PP Processing .....	31
3.1.2 Shrinkage of Materials Processed by 2PP technique .....	34
3.1.3 Structuring of Acrylated Poly(Ethylene Glycol)s with 2PP .....	38
<u>3.2 Applications of 2PP in Microphotonics</u>	
3.2.1 Fabrication of Microoptical Elements .....	41
3.2.2 Realisation of 3D Photonic Crystals	
Theoretical Investigations of Properties of 3D Photonic Crystals .....	45
Results of Experimental Realisation of 3D Photonic Crystals: .....	52
Fabrication of 3D Photonic Crystals Containing NLO Chromophore .....	60
Fabrication of Shaped 3D Photonic Crystals .....	62
<u>3.3 Biomedical applications of 2PP Technique</u>	
3.3.1 Microneedles for Transdermal Drug Delivery .....	65
3.3.2 Fabrication of Microprosthesis .....	71
3.3.3 Scaffolds for Tissue Engineering .....	75
 <b>4 Summary and Outlook .....</b>	<b>79</b>
 <b>References .....</b>	<b>85</b>
 <b>List of own Publications .....</b>	<b>95</b>