

Contents

1	Introduction	1
1.1	Utilization of the Optical Near-Field	1
	References	4
2	Controlling the Size and Position in Nanoscale	5
2.1	Introduction	5
2.2	Fabrication of Nano-structure Using Optical Near-Field	5
2.2.1	Photo Chemical Vapor Deposition	5
2.2.2	Near-Field Optical Chemical Vapor Deposition	12
2.2.3	Regulating the Size and Position of Deposited Nanoparticles	19
2.2.4	Observation of Size-Dependent Resonance of Near-Field Coupling Between Deposited Zn Dot and Probe Apex During NFO-CVD	26
	References	29
3	Self-assembled Size Regulation and Its Alignment	33
3.1	Introduction	33
3.2	Size-, Position-, and Separation-Controlled One-Dimensional Alignment of Nanoparticles Using an Optical Near Field	34
3.3	Self-assembly of Size- and Position-Controlled Ultra-long	41
3.4	High-Resolution Capability of Optical Near-Field Imprint Lithography	45
3.5	Self-assembly of ZnO QDs	50
3.6	Self-assembly Method of Linearly Aligning ZnO Quantum Dots	56
	References	63

4 Phonon-Assisted Process	67
4.1 Dressed-Photon and Phonon.....	67
4.2 Angstrom Scale Flattening Process	68
4.2.1 Phonon-Assisted Optical Near-Field Etching	69
4.2.2 In situ Real-Time Monitoring of Changes in the Surface Roughness During Phonon-Assisted Optical Near-Field Etching	72
4.2.3 Self-organized Near-Field Etching of the - Sidewalls of Glass Corrugations	79
4.2.4 Repairing Nanoscale Scratched Grooves on Polycrystalline Ceramics Using Optical Near-Field Assisted Sputtering.....	85
4.3 Site Selective Patterning	89
4.3.1 Production of Size-Controlled Si Nanocrystals Using Self-organized Optical Near-Field Chemical Etching	89
4.3.2 Site-Selective Deposition of Gold Nanoparticles Using Non-adiabatic Reaction Induced by Optical Near Fields	94
4.4 Increased Spatial Homogeneity	104
4.5 Improving the Device Efficiency Using the Phonon- Assisted Process.....	107
References	114
5 Some Remarks and Outlook	117
5.1 Remarks	117
5.1.1 Photolithography.....	117
5.1.2 Near-Field Etching.....	118
5.1.3 Light Emitting Devices	118
5.1.4 Nanophotonic Energy Conversion	118
5.2 Summary	119
References	120
Index	121