



Sven Passinger (Autor)

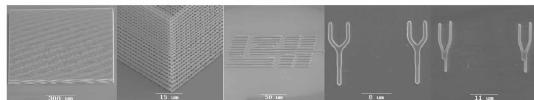
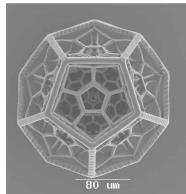
## **Two-Photon Polymerization and application to Surface Plasmon Polaritons**

Sven Passinger

---

### **Two-Photon Polymerization and application to Surface Plasmon Polaritons**

---



Cuvillier Verlag Göttingen

<https://cuvillier.de/de/shop/publications/1390>

Copyright:

Cuvillier Verlag, Inhaberin Annette Jentzsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen,  
Germany

Telefon: +49 (0)551 54724-0, E-Mail: [info@cuvillier.de](mailto:info@cuvillier.de), Website: <https://cuvillier.de>

# Contents

<b>1. Introduction</b>	<b>7</b>
<b>2. Two-Photon Polymerization and experimental realization</b>	<b>11</b>
2.1. Overview of nanostructuring techniques . . . . .	11
2.2. State-of-the-art and basics of Two-Photon Polymerization . . . . .	15
2.3. System for Two-Photon Polymerization . . . . .	18
2.4. Comparison of different laser systems for 2PP . . . . .	26
2.5. High speed 2PP structuring . . . . .	32
2.6. Example applications for 3-dimensional structuring . . . . .	39
2.7. Summary . . . . .	44
<b>3. Surface Plasmon Polaritons</b>	<b>49</b>
3.1. Introduction to Surface Plasmon Polaritons . . . . .	49
3.2. Guiding SPP devices . . . . .	54
3.3. Materials for SPP structures . . . . .	56
3.4. SPP modes of dielectric waveguides . . . . .	56
3.4.1. SPP mode solving for dielectric waveguides . . . . .	56
3.4.2. FDTD simulations for SPPs in dielectric waveguides . . . . .	58
3.4.3. Properties of SPP dielectric waveguides . . . . .	62
3.5. Summary . . . . .	69
<b>4. Theoretical analysis of SPP Y-splitters</b>	<b>71</b>
4.1. Review of known Y-splitter designs . . . . .	71
4.2. Real Y-splitter model . . . . .	81
4.3. Alternative Y-splitter designs . . . . .	85
4.3.1. Multi-mode-splitter . . . . .	85
4.3.2. A high efficient Y-splitter design . . . . .	88
4.4. Summary . . . . .	91
<b>5. Experimental investigations on Surface Plasmon Polaritons</b>	<b>93</b>
5.1. Experimental realization . . . . .	93
5.1.1. Fabrication of DLSPPWs . . . . .	93
5.1.2. Scanning-near-field-optical-microscopy and leakage radiation microscopy . . . . .	98
5.1.3. Simulations of DLSPPWs for different wavelengths . . . . .	107
5.1.4. Excitation of SPP and optical modes in DLSPPWs . . . . .	113
5.1.5. The effective refractive index of DLSPPWs . . . . .	120

*Contents*

5.2.	Leakage radiation measurements on DLSPPWs . . . . .	128
5.2.1.	Straight lines and bend structures . . . . .	128
5.2.2.	Different designs for Y-splitter structures . . . . .	133
5.2.3.	Mach-Zehnder interferometer . . . . .	138
5.3.	Further SPP structures . . . . .	141
5.4.	Summary . . . . .	142
<b>6.</b>	<b>Summary and outlook</b>	<b>145</b>
<b>Bibliography</b>		<b>147</b>
<b>A. List of own publications</b>		<b>165</b>
A.1.	List of own publications . . . . .	165
A.2.	List of won prizes . . . . .	168
A.3.	Curriculum vitae . . . . .	169
<b>B. Acknowledgments</b>		<b>171</b>