Laser-induced forward transfer of Au microstructure on a Si$_3$N$_4$ channel waveguide and its plasmonic effect

Abbas Salmanirezaei
Kamalpreet S. Kaur
Geert Van Steenberge
Laser Printing of Au structures

Plasmonic Effect of Au structures
Laser Printing of Au structures

Currently, fabrication of the metallic structures on waveguides requires two-steps:

1. defining metallic structure using ebeam lithography and etching
2. defining waveguide around the metallic structure by second litho step followed by etching

a slow and complicated process
Laser Printing of Au structures

**LIFT = Laser Induced Forward Transfer**

- high resolution features
- (non-)planar substrate
- Variety of materials
- Inexpensive
- Maskless
- Single-step process
## Laser Printing of Au structures

### Amplitude Systems SATSUMA laser

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Power</td>
<td>5.3 W</td>
</tr>
<tr>
<td>Pulse Energy</td>
<td>10 μJ</td>
</tr>
<tr>
<td>Beam Diameter</td>
<td>X direction: 2.1μm Y direction: 2.1μm</td>
</tr>
<tr>
<td>Pulse Duration</td>
<td>273 fs</td>
</tr>
<tr>
<td>Central Wavelength</td>
<td>1030 nm</td>
</tr>
<tr>
<td>Objective Lens</td>
<td>NA = 0.4 Mag: 20X</td>
</tr>
</tbody>
</table>

### microSTRUCT vario (2912-295)
Laser Printing of Au structures
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J = 443 (mJ/cm²)
Laser Printing of Au structures
Laser Printing of Au structures

Plasmonic Effect of Au structures
Plasmonic Effect of Au structures
Plasmonic Effect of Au structures

Diagram showing the interaction of light with metallic structures, demonstrating the propagation of plasmon waves and the effect on reflection as a function of angle of incidence.
Plasmonic Effect of Au structures

Air

Au

Dielectric (Core)

θ
Plasmonic Effect of Au structures

Fundamental TM mode @ 1.38 µm
Plasmonic Effect of Au structures
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Plasmonic Effect of Au structures
THANKS for your attention!
Any Question?