

## 3D PHOTONIC MATERIALS

Nowadays, in telecommunication technology as well as for photonic circuits and devices, materials whose optical response can be tailored by design are being developed. Nanoscribe's Photonic Professional GT2 offers the highest resolution known in 3D fabrication and submicron feature sizes typically on or below the length scale of the wavelength of light, leading to novel optical properties proven in reflection and transmission measurements. Subsequent processes such as electroplating, and single or double inversion using ALD and CVD allow to transfer polymer templates into different materials, e.g., gold, titanium dioxide, silicon.

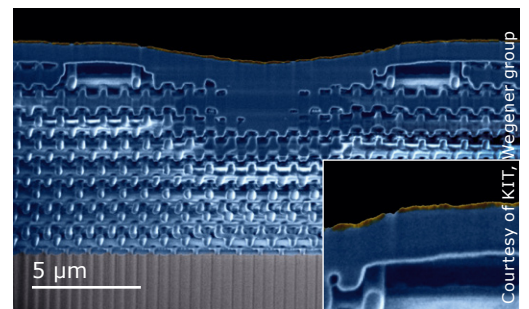


### 3D INVISIBILITY CLOAK

**Challenge:** Realization of spatially varying, tailored effective refractive index distribution in 3D for hiding a metallic bump at optical wavelengths.

**Solution:** 3D woodpile photonic crystal with rod distance of 800 nm and varying rod width is fabricated with the polymer material IP-L.

**Source:** DOI: 10.1126/science.1186351

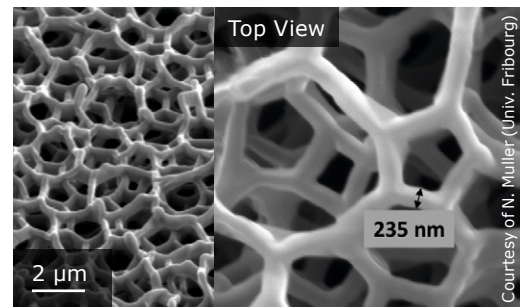


### SILICON PHOTONIC BANDGAP MATERIAL

**Challenge:** Rationally designed aperiodic 3D structure from a high refractive index material with a photonic bandgap in the near infrared.

**Solution:** Polymer networks are printed, coated with TiO<sub>2</sub> by ALD and the polymer is removed by calcination. The remaining shrunk TiO<sub>2</sub> structure is infiltrated with silicon by CVD.

**Source:** DOI: 10.1002/adom.201300415

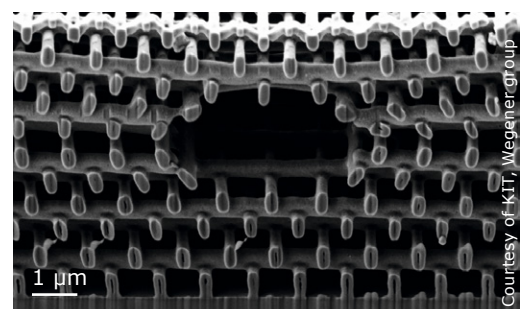


### PHOTONIC PARTICLE-ACCELERATOR

**Challenge:** Fabrication of an air waveguide inside a 3D photonic-crystal in order to accelerate electrons using a confined optical mode.

**Solution:** Woodpile structure with a waveguide inside is printed. After fabrication, the silicon replica of the printed structure is generated via silicon double inversion.

**Source:** DOI: 10.1364/OE.20.005607

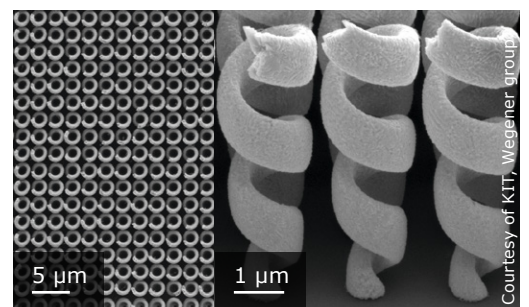


### TAPERED GOLD-HELIX BROADBAND CIRCULAR POLARIZER

**Challenge:** Fabrication of arrays of gold-helices whose radii increase gradually along the helix axis serving as broadband circular polarizers in the mid-infrared.

**Solution:** Positive-tone resist template with helices is printed and then transferred to gold by LIGA processes. The resist is then removed by plasma etching.

**Source:** DOI: 10.1063/1.3693181



Learn more about the world's  
highest resolution 3D printer  
Photonic Professional 

#### Nanoscribe GmbH

Phone +49 721 981 980 0

E-Mail [photonicmaterials@nanoscribe.com](mailto:photonicmaterials@nanoscribe.com)

Web [www.nanoscribe.com](http://www.nanoscribe.com)