MONTANA STATE UNIVERSITY

Spectrum LAB
Montana State University

MICRO-FABRICATION CAPABILITIES

Customized micro-optics made on demand

Two-photon 3D printing, a design-to-print workflow and in-house characterization for custom micro-optics.



Custom optics too small to see

Our two-photon printer uses a focused laser to build lenses and other optical parts layer by layer, with features smaller than a wavelength of light. We design, print and inspect them all in-house.

<200 nm
Smallest printed feature size

750 mm/s
Maximum print speed

40 mm
Largest part, per side (40 × 40 × 40 mm)

~1.5
Refractive index of printed optics at 1550 nm

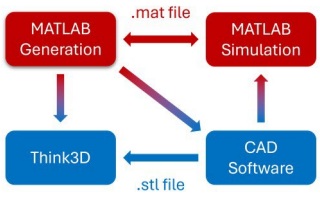
FROM DESIGN TO DEVICE



Two-Photon 3D Printer

UpNano NanoOne 100 · two-photon polymerization

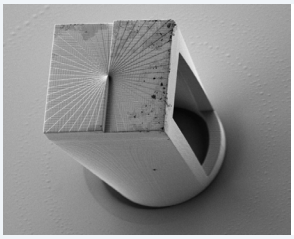
- Features below 200 nm
- Refractive index 1.49–1.51 at 1550 nm
- Parts up to 40 × 40 × 40 mm at up to 750 mm/s



Design Workflow

From code to printed part

- Optics generated and simulated in MATLAB
- Refined in CAD and exported as .stl files
- Prepared for printing in UpNano Think3D



Optical Profilometer

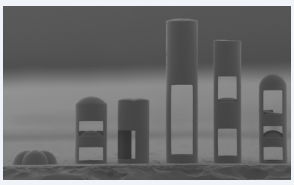
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- Confocal microscopy
- Phase-shifted interferometry
- Coherence scanning interferometry
- Spectroscopic reflectometry

Multi-Mode Microscope

Quantum Design FusionScope

- Atomic force microscopy (AFM)
- Scanning electron microscopy (SEM)
- Energy dispersive spectroscopy (EDS)



Work with us

- Custom micro-optics for research and industry
- Printing directly onto optical fiber tips



TALK TO US ABOUT A PROJECT

spectrum.montana.edu

Mountains and Minds
Montana State University

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