

The Center for Advanced Micro- and Nano-Optics located at the Fraunhofer IOF provides its customers a microstructure fabrication facility that meets the parameters otherwise only achievable in a semiconductor manufacturing plant. Covering the whole process chain of advanced optic development, the center is specialised in diffractive optics. Diffractive optics based on micro- and nanostructured surfaces offer flexible possibilities to present new optical functionality which are often barely achievable with conventional optics. This opens up new areas of application for optics.

Supported by

- European Union
- Thuringian Ministry of Education and Culture
- Fraunhofer-Gesellschaft
- Federal Ministry of Education and Research

In collaboration with

- Institute of Applied Physics of the Friedrich-Schiller-University Jena



CONTACT

CMN-OPTICS

CENTER FOR ADVANCED MICRO- AND NANO-OPTICS



Person to contact

Dr. Thomas Flügel-Paul

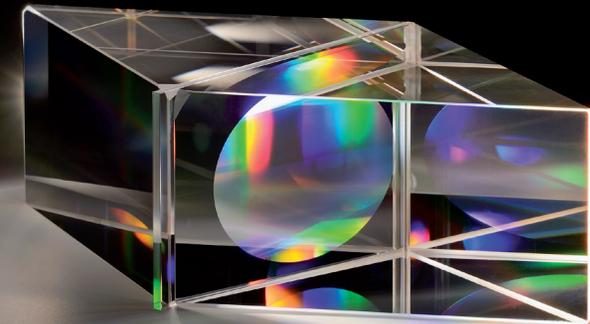
Fraunhofer Institute for Applied Optics
and Precision Engineering IOF
Beutenberg Campus
Albert-Einstein-Straße 7
07745 Jena
Germany

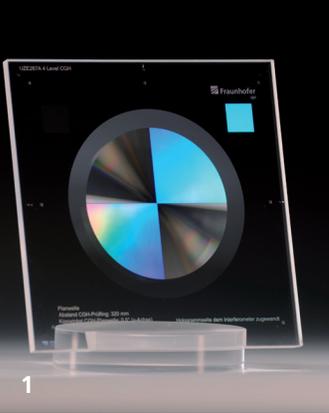
Phone: +49 (0) 3641 807-434

Fax: +49 (0) 3641 807-603

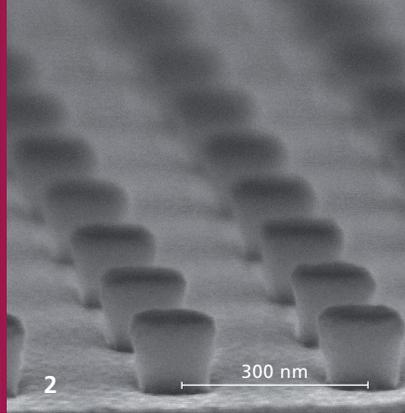
E-mail: thomas.fluegel-paul@iof.fraunhofer.de

Internet: www.cmn-optics.org



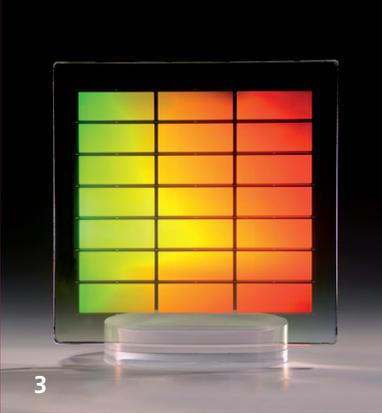


1

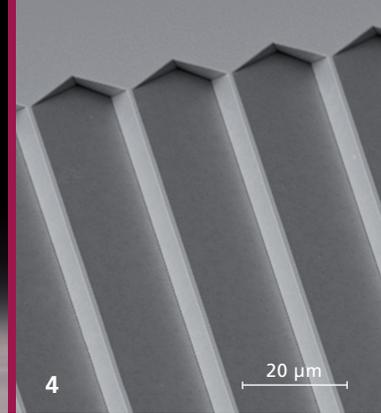


2

300 nm

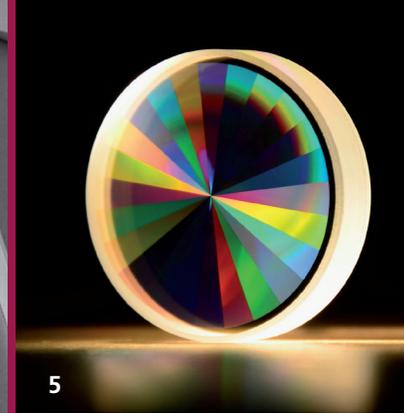


3

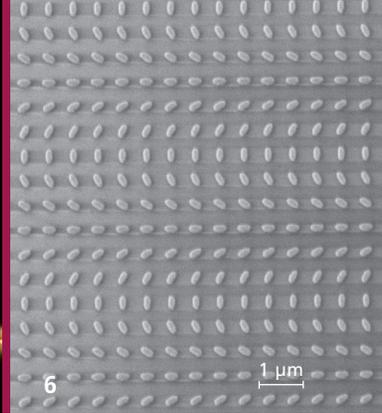


4

20 μm



5



6

1 μm

FULLY CUSTOMIZED OPTICAL ELEMENTS

From design to characterization to satisfy customer needs

- Optical elements design
- Technology consulting
- Adapted manufacturing technologies for customized element generation
- Integration of single components into complex systems (specific optical/mechanical design)
- Optical and structural characterization
- Assembling of prototypes
- Processing of optical elements and administration according to ISO 9001 standard



- 1 Effective-medium CGH for interferometric testing of aspheres
- 2 High resolution resist pattern
- 3 Transmission gratings
- 4 Echellette grating
- 5 Segmented quarter-wave plate
- 6 Metallic Nano-Wire array working as circular polarizer

TECHNOLOGY

Micro and nanostructuring

- Electron Beam Lithography System SB350 OS
 - 300mm diameter writing capability
 - Minimum feature size < 65 nm
 - Address grid 1 nm
 - Placement accuracy < 15 nm
 - Advanced multilevel technology
 - Efficient data processing capability

Accompanying technologies

- Planarization / IB and MR figuring of substrates
- Adhesive-free fused silica direct bonding
- Resist technology for 12" substrates
- Reactive ion etching
 - Silicon, fused silica, high index materials
 - Etching aspect ratio > 1:10
- Coating
 - HR, AR, metals
 - Atomic Layer Deposition (ALD)
 - Sputtering, evaporation
- Wafer dicing and ultra precision machining
- Wafer scale replication

CHARACTERIZATION

- Scanning electron microscope
 - Focused ion beam tooling
 - Material analysis (EDX, EBSD)
- Atomic force microscope on 12" substrates
 - Height resolution 0.05 nm
- 12" plane-wave interferometer
 - 11" reference plane, WFE < 4 nm rms
- Interference optical surface profiler
- Ellipsometer for layer stack characterization
- Measurement of optical function, e.g. efficiency, polarization sensitivity

APPLICATIONS

- Computer generated holograms (CGH)
- Diffraction gratings
- Beam splitters
- Sub-wavelength gratings, e.g. polarizer, wave-plates
- Highly efficient large scale pulse compression gratings
- Spectrometer gratings and GRISMs
- Photonic crystals

Selected references

- Effective medium grating for ESA GAIA mission
- NIR grating for ESA Sentinel 4 space mission
- Grating for Sentinel 5 Space Mission