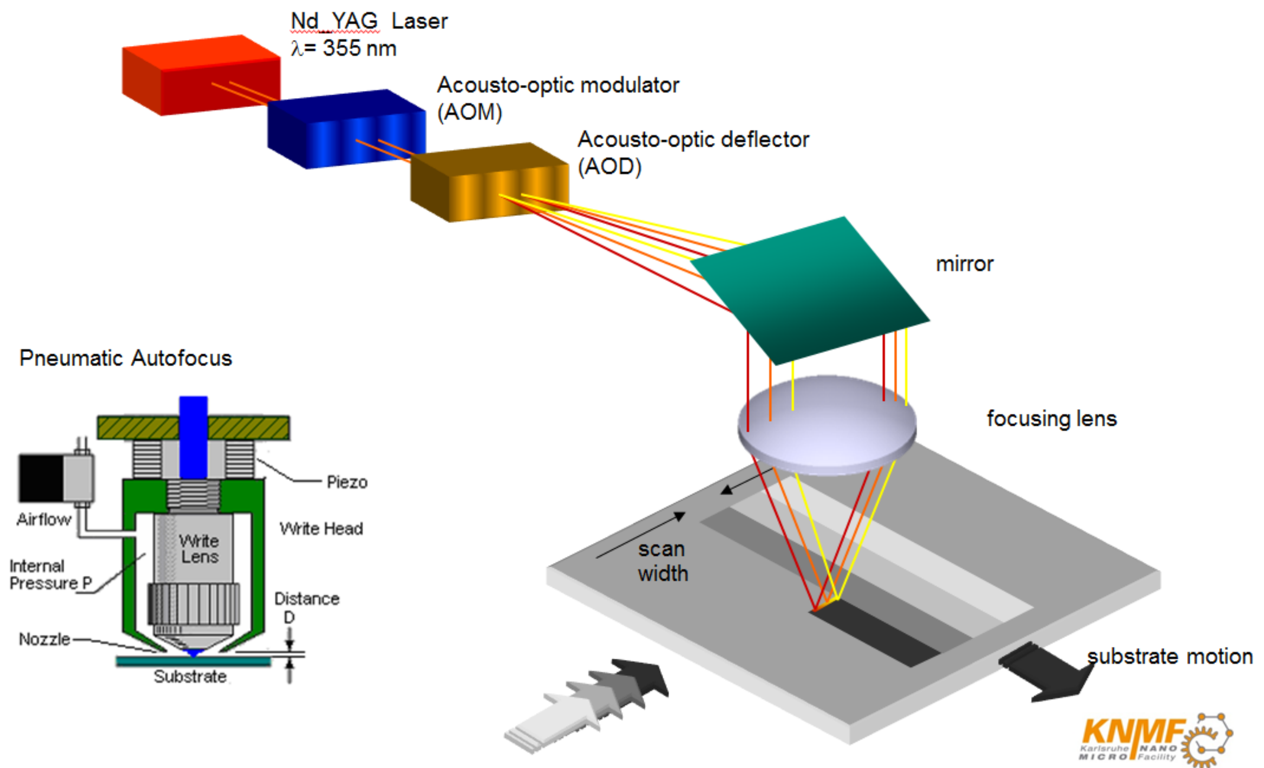
Direct Laser Writing

With DLW resist 2D-patterns in the µm-range are written in a photo resist layer on a substrate with a focused laser beam. No mask is needed as in conventional photo lithography.



The writehead allows feature sizes down to 2.5 µm with a substrate size up to 6”. The machine complements E-Beam lithography and is a less expensive and faster alternative for structures without nano sized features. Typically this method is applied to generate first prototypes and allows a faster iteration.

Due to the used wavelength of 355 nm it is possible to pattern thicker resist layers (*e.g.* SU-8 type resists). The focusing of the laser beam leads in this case to sloped sidewalls (< 5°).

In case of reflective substrates a bottom antireflection coating (BARC) has to be applied, which may be considered in the whole process layout.

Contact

See KNMF website or contact the KNMF User Office.

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Direct Laser Writing

Equipment

- Heidelberg Instruments DLW66 fs
- Writehead 10 mm and 4 mm (lower and higher resolution)

Features

- No mask needed
- The wavelength of the Laser (355 nm) allows to expose SU-8-Resist up to 300µm thickness and AZ-Resists up to 7µm thickness
- Writing speed is 35 mm²/min. A 4“ wafer will be written in round about 3 hours

Limitations/constraints

- The structure sidewalls are not vertical in case of thicker resist layers
- Aspect ratios up to 4 are possible depending on structures and/ or resists

Materials

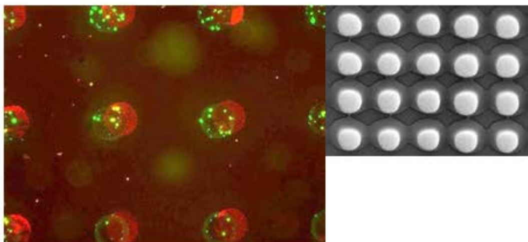
- Resists: AZ1505, AZ4533, SU8 and similar resists
- BARC: BARLI-II
- Substrate properties:
  - flat
  - roughness peak to peak < 80 µm
  - 100 µm < thickness < 2500 µm

Data

- Data File format: gds-II, dxf (2D), cif
- To work with good files the following hints are very useful:
  - closed polylines should be used
  - layers should not be named "main"
  - define proper scale before designing your pattern
  - use appropriate number of points in polygon approximation

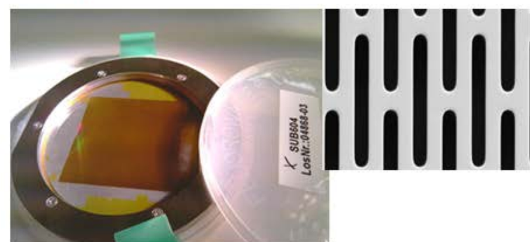
Structure examples

- Biological applications



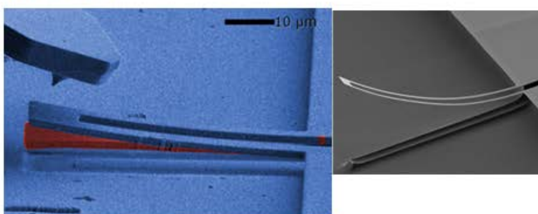
Stamps for peptides

- X-Ray masks

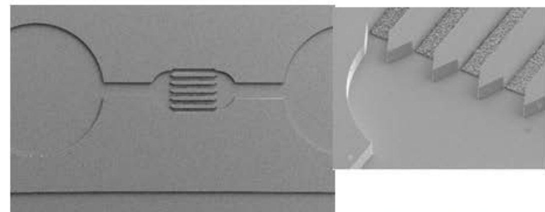


Grid structures; period 10 µm

- actuators



- Microfluidics



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