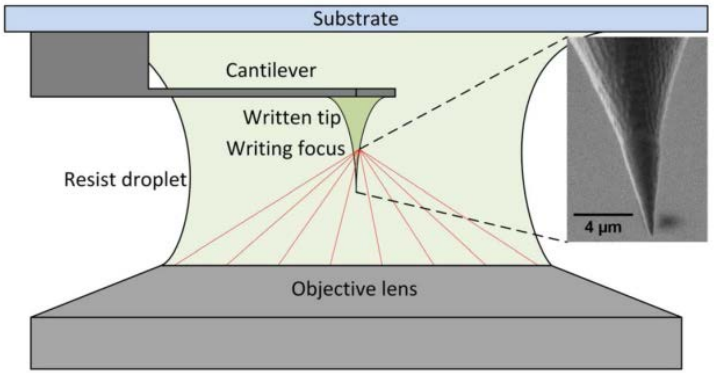
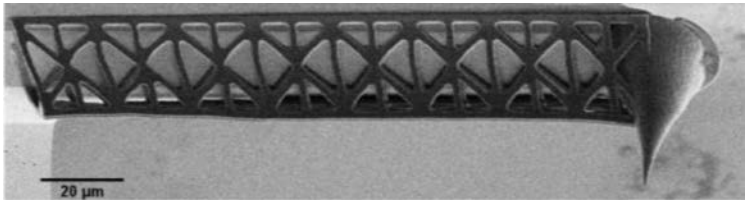
Master Thesis:
3D Nanoprinting for Scanning Probe Microscopy

Karlsruhe Institute of Technology

3D direct laser writing based on two-photon polymerization is used as a tool to fabricate tailored probes for scanning probe microscopy (SPM). Tips with radii of 25 nm and arbitrary shape have already been demonstrated. Long-term scanning measurements reveal low wear rates and demonstrate the reliability of such tips. Furthermore, we showed that the resonance spectrum of the probe can be tuned for multi-frequency applications by adding rebar structures to the cantilever. Based upon this finding we want to equip SPMs with more complex structures to enhance scanning speed and sensing capabilities. At the same time 3D-printing offers new possibilities to reduce probe sizes and open up accessibility of samples to SPM measurements.



Fabrication of SPM Probe with TPP



Example of AFM probe with rebar structure for resonance tuning

Goering *et al.* Appl. Phys. Lett. 2016

Your tasks:

- Design of freeform probes for SPM
- Optimisation of measurement setup
- Micromechanical simulation
- Fabrication by a 3D-printer based on two-photon polymerization (TPP)
- Testing of your probes by performing SPM scans

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