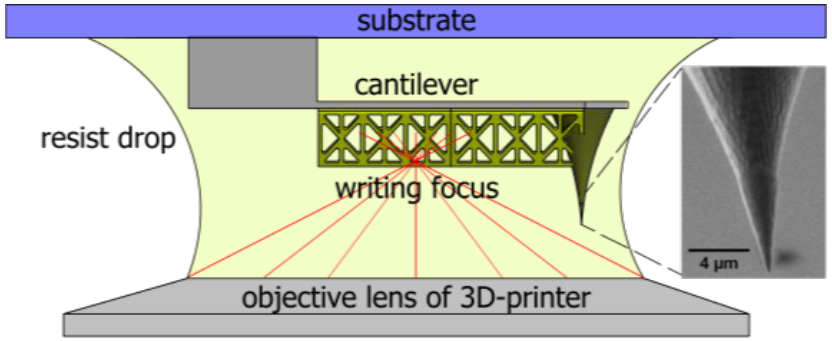
Master Thesis for Physicists and Engineers:
3D Nano-Printing and Atomic Force Microscopy (AFM)

Karlsruhe Institute of Technology

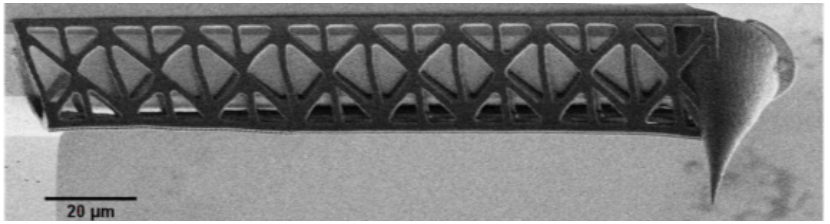
3D direct laser writing based on two-photon polymerization is used as a tool to fabricate tailored probes for atomic force microscopy (AFM). Tips with radii of 25 nm and arbitrary shape have already been demonstrated. Long-term scanning measurements reveal low wear rates and demonstrate the reliability 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 AFMs with more complex structures to enhance scanning speed and sensing capabilities.

Your task will be to develop and validate new types of AFM by using 3D printing. This involves

- Design of freeform structures of tips and support structures
- Micromechanical simulation
- Fabrication by a 3D-printer based on two-photon polymerization (TPP)
- Testing of your tips by performing AFM scans



Fabrication of AFM tips with TPP.



AFM tip with rebar structure for resonance tuning.

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