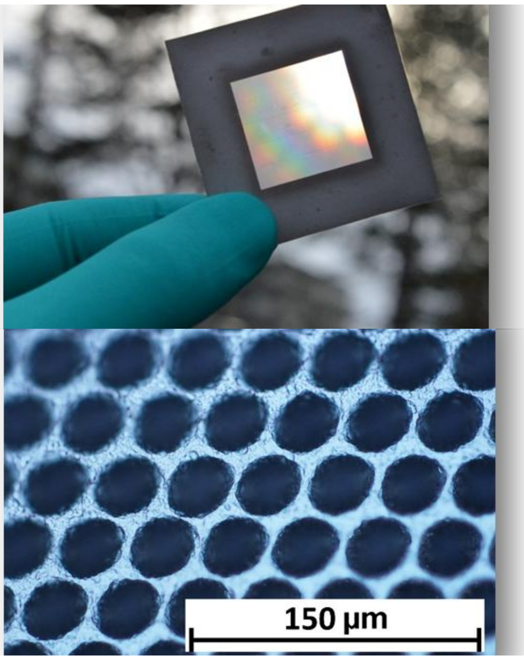
Master Theses

Process development for microdrilling silicon nitride



Microdrilling using ultrashort pulse lasers (USP) enables the high-precision production of extremely micrometer-scale drill holes with a minimal heat-affected zone. With pulse durations in the pico- to femtosecond range, the material is removed with minimum thermal damage, which is particularly advantageous for temperature-sensitive or brittle materials. This is of utmost importance for the semiconductor industry, where large numbers of micro-holes must be placed in a very small space in order to meet the performance requirements of the modern electronics industry. In recent years, several projects have already been carried out at the LAT for drilling stainless steel, glass and titanium, among other materials. In this master's thesis, the process is now to be adapted for the machining of silicon nitride (SiN) so that 300 µm thick films can be used as a functional layer in the semiconductor industry.

Tasks:

- Various optical setups are to be tested for their suitability for drilling silicon nitride
- The optical setup is to be adapted so that square holes can be created.
- Process optimization is to be used to optimize the drill holes in terms of taper angle, aspect ratio and shape deviations.
- Process development requires the characterization of the drill holes using (scanning electron) microscopy.

Requirements:

- Experience in working with optical laboratory setups is advantageous.
- The module Laser materials processing or a comparable module should have been completed.

Contact:

Dr.-Ing. Jan Marx
Office: ID 05/631
Mail: Jan.Marx@rub.de
Phone: 0234 32 23579