Master's Thesis

in

Engineering Hard Masks using Thin Films for Quantum Technologies

Contact UT:
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Contact FZJ:
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Start of work: by arrangement

Background:

Within the chair Mesoscale Chemical Systems @ the University of Twente is an assignment focussing on design/simulations of "stress diagnostic structures".

Such structures can be used to estimate the residual stress in thin films deposited on (for example) sapphire; films that can be deposited on Sapphire are LPCVD Si3N4, LPCVD TEOS, LPCVD poly-Si and wet/dry oxide films.

For these thin film materials, the geometry of the stress diagnostic structures must be determined & optimized. Subsequently, these structures will be realized in the MESA+ NanoLab @ the University of Twente, Netherlands cleanroom in combination with work at Forschungszentrum Jülich, Germany (FZJ).

In fact, FZJ has the worlds' first thermal laser epitaxy (TLE) which can reach, through CO2 laser heating, unprecedented high temperatures (>2000°C) compared to traditional annealing methods. More information on the project can be found on TLE4HSQ- Quantentechnologien.

Requirements:

University studies in physics, material science or nano-engineering; interested in new physics and phenomena; ability to work in a team and autonomously. Traveling between the two research centers is to be expected as well as potential long stays in either facility.

We offer:

- A pleasant working environment within a highly competent, international team in two of the most prestigious research facilities in Europe.
- You will be supported by top-end scientific and technical infrastructure like a state-of-the-art cleanroom and one of the largest and most advanced MBE clusters worldwide.
- You will have the opportunity to work with excited researchers from various scientific fields and take part in the fabrication and characterization of cutting-edge devices.

Your tasks:

You will deposit thin film layer using advanced tools like the Low-Pressure Chemical Vapor Deposition. The film can be then patterned into relevant shapes for eventually creating hard masks for quantum technology application devices, such as Josephson junctions.

This includes:

- Stress analysis of thin films through various tools,
- Annealing at various temperature,
- Wet chemistry processing,
- Shadow evaporation tests,
- Mechanical Simulation and fabrication.

Other tasks will include:

- Cleanroom work, Dry Etching, Lithography,
- Scanning electron microscope, Atomic force microscopy, Dektak Analysis
- Report and Analysis

Together with your supervising Ph.D. student, you will design, fabricate and measure as prepared devices.

Contact UT:

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