

Master Thesis

Generation of color centers in diamond for quantum light sources

Background

As quantum technologies gain more and more attention, the interest in light sources that emit single photons is rapidly growing. Single photon sources can be created by making use of a certain group of lattice defects (called *color centers*) in diamond. The most prominent of them is the nitrogen-vacancy center. This is a point defect in the diamond lattice consisting of a nitrogen atom, which substitutes a native carbon atom, located next to a lattice vacancy. The nitrogen-vacancy center creates spatially localized ground and excited states that can be driven by an optical transition in the visible range. The photon, which is emitted when the excited state decays into the ground state, can be used as the basis of a single photon source.

Within the framework of a BMBF (Bundesministerium für Bildung und Forschung) project we want to establish a process for the deterministic creation of color centers in diamond.

The Master project

1. Becoming familiar with the topic (color centers in diamond)
2. Participation in the planning and testing of different processing technologies of diamond with the following aims:
 - Creation of suitable diamond sheets as a starting point for further processing
 - Artificially creation of color centers; this may include the artificial implantation of nitrogen or other atoms
 - Coupling of the defects to optical nanostructures such as resonators and waveguides
 - Development of an optical setup to collect and process the fluorescence signal emitted by the color center

A focus for the Master thesis can be developed within the first phase of work.

Prerequisites

- Dedication to get familiar with a new topics
- Motivation to work experimentally within an interdisciplinary team
- Good knowledge and understanding of solid state physics and optics

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