

Master thesis or Internship in the Weil working group (subgroup: Nanodiamond)

Max Planck Institute for Polymer Research

Topic: *In-situ* radical monitoring photothermal / photodynamic therapy in living cells

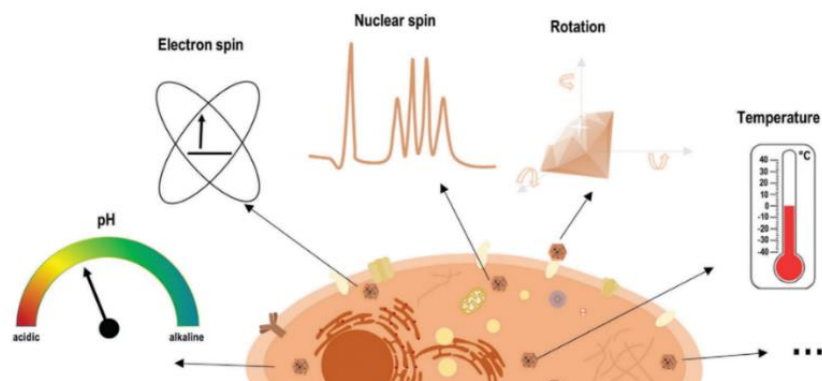


Photo therapy, including both photothermal therapy (PTT) and photodynamic therapy (PDT), is one of the latest therapy method to cure the cancer. PTT is a technique that convert light into heat energy to kill the cancer cells, while PDT involves light-sensitive medicine and a light source to destroy abnormal cells. However, microscopic

scale cellular response upon phototherapy have not been investigated. Nitrogen-Vacancy centers (NV⁻) embedded fluorescent nanodiamonds (ND) exhibit good biocompatibility, stable fluorescence, and high quantum efficiency. Additionally, the unique property of NV centers can be used to detect electrons and, in some cases, even nuclear spins under ambient conditions via optical readout at ambient environment. All these make ND as a promising candidate to investigate cellular response from a more microscopic dimension. We aim to use this unique property of ND to detect the cellular radical response (paramagnetic ROS) *in situ* upon phototherapy.

Key words: Nanodiamond, NV center, Radical Sensing, Nanomedicine, Phototherapy

See: Wu, Y., Weil, T., Recent Developments of Nanodiamond Quantum Sensors for Biological Applications. *Adv. Sci.* 2022, 9, 2200059. <https://doi.org/10.1002/advs.202200059>.

Your tasks:

- Synthesis of photothermal/photodynamic therapeutic molecules with organelle targeting, and functionalization of ND for subcellular level delivery
- Characterization of nanodiamond by DLS, Zeta potential, IR, UV, TEM, etc.
- Radical sensing (T1 relaxation time measurement) in living cells.

We offer:

- Innovative and interdisciplinary research project
- Scientific work in modern and well-equipped laboratories with access to all necessary instruments
- International working group

We are looking for a candidate with:

- Very good performance in science studies (preferably chemistry or cell experience).
- Good English skills.
- Great interest in the synthesis of materials for biological applications.

Start of thesis: Oct/Nov2023 - If you are interested, please contact: Qi Lu - luq@mpip-mainz.mpg.de