INTERACTIONS OF OPTICAL FIBER PROBES WITH PROTEINS TUNED BY FLUORESCENT NANODIAMONDS

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The development and applications of quantum technologies and nonlinear spectroscopy for studies of color centers in diamonds are very fast. Thanks to the stable crystallographic and electron structure of diamond, NV-color centers exhibit very stable electronic spectra, resistant to various perturbations. Their excellent optical and spin properties allow one to use different resonance and spintronic methods of and enable precision metrology.

In this study, fluorescent suspensions of diamond particles have been produced by microbead assisted ultrasonic disintegration of commercially obtained diamond powder containing NV color centers[1]. The suspensions characterization was be based on optical (absorption, emission, Raman) and microwave spectroscopy with high spatial resolution[2]. The treatment allows for decrease of grain size and surface modification of nanodiamonds to achieve stable deionized water-based suspensions.

Furthermore, fluorescent suspensions were deposited onto optical fiber structures by dip-coating procedure. Photonic tapered structures were fabricated by using a fiber-optic splicer (Ericsson FSU 975) and a telecom, multi-mode optical fibers. The optical fibers structures covered with fluorescent nanodiamond nanoparticles were applied as optical fiber probes of organic matter. Probes provided a waveguide delivery of optical field for the initialization, polarization, and readout of the electron spin in NV color centers revealing direct interactions with proteins (e.g. fetal bovine serum).

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