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Towards spin-photon interface for NV color center in diamond

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Nitrogen Vacancy (NV) color centers in diamond attract a lot of attention of quantum optics and quantum information community. Due to its long coherence time, possibility of optical readout of electronic spin state and possibility to store information in nearby nuclear spins using this center long quantum memory even at room temperature, long distance quantum entanglement and quantum registers has been demonstrated. Besides, quantum information application, this color center is proven to be good high-resolution sensor of magnetic field. Such a sensor is able to combine nanometer resolution with single spin sensitivity. Furthermore, due to its low chemical activity, diamond could be used as in vivo sensor. Recently, successful implementation of NV nanodiamonds as temperature sensors for measurement of thermal activation of transient receptor potential was demonstrated. NV color center in diamond could also be used for measurement of electric fields, tension, rotation or force. This sensor could offer high resolution or cutting edge sensitivity, if bulk sample is used. Also, due to its unique photo stability, this color centers find application in imaging, in particular bio- imaging as well as high resolution imaging such as STED or RESOLFT. In many of these applications, one of the important issues is efficiency, with which light emission of the color center is collected. In this contribution, we present our results on broadband collection of NV color centers emission using optical fiber and nanostructures.

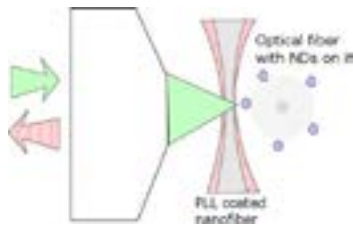


Figure1: Procedure of single nanocrystal pickup onto optical fiber

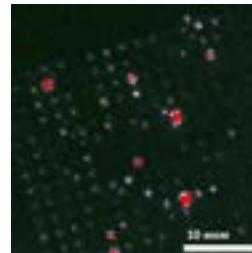


Figure2: Positioning on nanocrystals on nanostructures

Biography

Alexey Akimov received his PhD degree from Moscow Institute for Physics and Technology in 2003. In 1997, he started working in the Laboratory for Active Media at the Lebedev Physical Institute of the Russian Academy of Sciences. His research was focused on the narrow optical resonances in hot and laser-cooled atoms. During 2006-2012, he was a Visiting Scholar in Misha Lukin's group in Physics Department of Harvard University, where he worked on a number of research projects related to surface plasmons, quantum dots and NV centers in diamond. The main focus of this activity was light-spin interfaces. During 2010-2012, he was the Acting Director of the Russian Quantum Center (RQC). He then assumed a Principal Investigator position at the RQC and conducted research in the fields of cold atoms and solid state spin systems. In October 2015, he joined the Physics Department of Texas A&M University as an Assistant Professor.

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