HL 46: Hybrid systems

Time: Thursday 12:30–13:00 Location: POT 151

HL 46.1 Thu 12:30 POT 151

Optoelectronic Properties of Hybrids made of the Photosynthetic Reaction Center (PS I) and Carbon Nanotubes

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The photosystem I (PS I) reaction center is a chlorophyll protein complex located in thylakoid membranes of chloroplasts and cyanobacteria. The PS I mediates a light-induced electron transfer through a serial of redox reactions [1]. The nanoscale dimension and the generation of 1 V photovoltage make the PS I reaction center a promising unit for applications in molecular optoelectronics. Utilizing a unique cysteine mutation at the end of the PS I, we demonstrate a four-step chemical procedure based on carbodiimide chemistry for covalent binding of the PS I to carbon nanotubes. The method allows studying nanosystems for the construction of optoelectronic devices based on PS I - carbon nanotube hybrids [2]. In addition, we present optoelectronic data of such hybrids consisting of carbon nanotubes and the PS I. We demonstrate that the integrated proteins are optoelectronically active [3].

[1] L. Frolov et al., Adv. Mater. 17, 2434 (2005). [2] I. Carmeli, M. Mangold, L. Frolov, B. Zebli, I. Carmeli, C. Carmeli, S. Richter and A.W. Holleitner, Adv. Materials 19, 3901 (2007). [3] S. Kaniber et al., (2009).

HL 46.2 Thu 12:45 POT 151

Coupling of self assembled Quantum Dots with nanoantennas

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The interaction between electronic and photonic systems on the nanoscale has attracted much interest in recent years. Important issues are the increase of the coupling efficiency of single quantum systems to light with optical nanoantennas and the differently modified radiative and nonradiative decay rates of this localized excitation. As particle plasmons in metal nanostructures (MNS) show a strong coupling to the light field, they seem to be promising candidates for this purpose. Here, we try to engineer the emission properties of excitations in self assembled GaAs QDs.

For the experimental investigation of the emission properties, we use a detection scheme with two fast avalanche photo diodes for polarization dependent time correlated single photon counting (TCSPC). Characterization of many single QDs with random distances (10 to 170nm) to resonant MNS shows a variation of the radiative decay rate of QD-excitons by the local field enhancement.

We will further demonstrate our results for preparation and characterization of well defined single Quantum Dot-Nanoantenna pairs.