Physikalisches Institut
Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

QE

Quantum Efficiency Seminar und Colloquium

FRANK JÄCKEL

Photonics and Optoelectronics Group
Department of Physics and Center for NanoSciences (CeNS),
Ludwig-Maximilians-Universität München

Charge and energy transfer in hybrid nanomaterials charge

ABSTRACT: Charge and energy transfer processes are of great importance for the use of renewable energies since they represent the fundamental processes responsible for charge separation and light harvesting in photovoltaic or photocatalytic devices.
In my talk, I will discuss our recent work on photocatalytic hydrogen generation employing Pt-decorated CdS nanorods. Using the semiconductor as an efficient light absorber the electron, after its transfer to the Pt sites, is used for water reduction in the presence of a sacrificial hole scavenger. With this simple approach quantum efficiencies up to 3.9% have been achieved.[1] The charge carrier dynamics of this photocatalytic hybrid nanosystem were studied with transient absorption spectroscopy. Surprisingly, a slow-down of the photoelectron transfer to the catalytic Pt sites was observed under hydrogen generation conditions as compared to situations where no significant amounts of hydrogen are generated.[2] This phenomenon can be explained by different degrees of localization and delocalization of the electronic wavefunction on the nanostructure in presence and absence of holes, respectively.
Furthermore, I will discuss the manipulation of energy transfer processes (i.e. Förster resonance energy transfer, FRET) wiht plamonic nanostructures. In particular, I will address plasmonic nanoresonators consisting of two spherical gold nanoparticles.[3]

1. Berr, M., Vaneski, A., Susha, A.S., Rodriguez-Fernandez, J., Döblinger, M., Jäckel, F., Rogach, A.L., Feldmann, J., Colloidal CdS nanorods decorated with subnanometer sized Pt clusters for photocatalytic hydrogen generation. *Appl. Phys. Lett.* **97**, 093108 (2010).
2. Berr, M., Vaneski, A., Mauser, C., Fischbach, S., A.S., Susha, Rogach, A.L., Jäckel, F., Feldmann, J., Delayed Photoelectron Transfer in Pt-Decorated CdS Nanorods under Hydrogen Generation Conditions. *Small* (in press).doi:10.1002/smll. 201101317
3. Faessler, V., Hrelescu, C., Lutich, A.A., Osinkina, L., Mayilo, S., Jäckel, F., Feldmann, J., Accelerating fluorescence resonance energy transfer with plasmonic nanoresonators. *Chemical Physics Letters* **508**, 67-70 (2011).

Date: **Tuesday, January 10th, 2011 16:15 pm**
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Contact: Andreas Buchleitner, Institute of Physics, Quantum Optics and Statistics
T +49 761 203 5821 F +49 761 203 5967 E buchleitner_office@physik.uni-freiburg.de
www.physik.uni-freiburg.de