October 12th, 2011 - 11:00 am

Seminar Room 108, DESY Bldg. 49

CFEL SCIENCE

Max Planck Research Department for Structural Dynamics

SEMINAR

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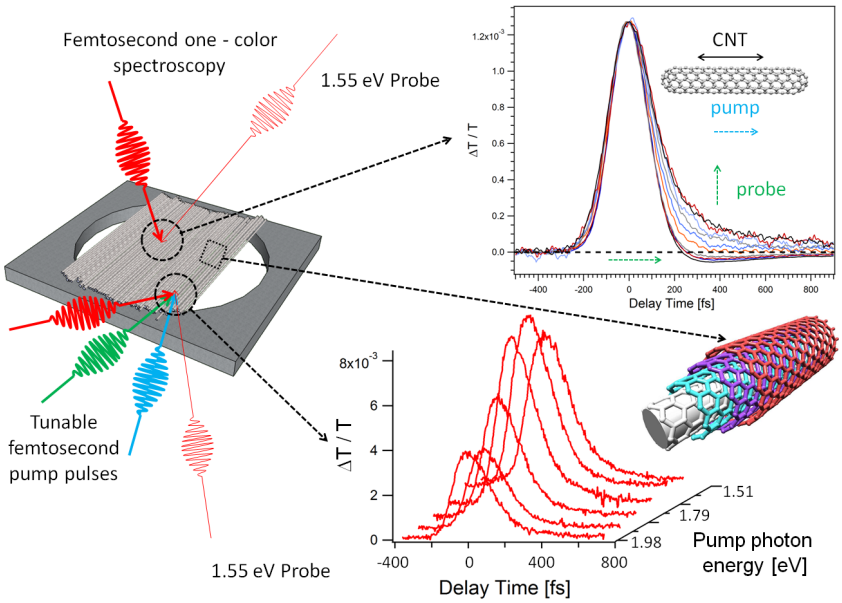
Exiton dynamics in aligned free-standing multi-wall carbon nanotubes

Multi-Wall Carbon Nanotubes (MWCNTs) show promising properties for different technological applications although, with respect to Single-Wall Carbon Nanotubes, many of their physical and electronic properties are almost unknown.
The goal of this work is to achieve a better understanding of the electronic behavior of MWCNTs by studying the relaxation channels of the carriers excited by a femto-second laser pulse on free standing horizontally aligned MWCNTs.
The MWCNTs excitonic behavior, revealed in this thesis work for the first time by means of one-color transient absorption spectroscopy, along with the high absorption cross-section over the whole visible spectrum, suggests that MWCNTs are ideal candidates for applications concerning detection and absorption of radiation. Moreover, if we consider that the multi shell structure enhances the conductivity, we can assess that MWCNTs are promising material for assembling photovoltaic cells. Indeed, the Incident-Photon-to-current Conversion Efficiency (IPCE) of the MWCNTs systems is known to be much higher with respect to the SWCNTs.
In addition, the measured excitonic behavior suggests that MWCNTs could exhibit Multiple Exciton Generation (MEG). This process is paramount for enhancing the IPCE value. In this work we observe the development of a new relaxation channel that could be ascribed to this important phenomenon.



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[2] Castrucci, P. Large photocurrent generation in multiwall carbon nanotubes, Applied Physics Letters 89, 253103 (2006);
[3] Wang, S. Multiple Exciton Generation in Single-Walled Carbon Nanotubes Nano Letters 10, 2381 (2010);

Host: Andrea Cavalleri, Condensed Matter Division, MPSD, CFEL