Plasmon Nanooptics with Pristine and Hybrid Nanotube Systems\textsuperscript{1} IGOR BONDAREV, North Carolina Central University, USA, MAXIM GELIN, WOLFGANG DOMCKE, Technical University of Munich, Germany — In general, plasmons cannot be excited by light in optical absorption since they are longitudinal excitations while photons are transverse. In small-diameter (\(\sim 1\) nm) semiconducting carbon nanotubes (CNs), light polarized along the CN axis excites excitons which, in turn, can couple to the nearest (same-band) interband plasmons \cite{1,2}. Both of these collective excitations originate from the same electronic transitions and, therefore, occur at the same (low) energies \(\sim 1\) eV, as opposed to bulk semiconductors where they are separated by tens of eVs. They do have different physical nature and properties. Their coexistence at the same energies in CNs is a unique feature of confined quasi-1D systems where the transverse electronic motion is quantized to form 1D bands and the longitudinal one is continuous. We discuss how low-energy interband plasmon excitations can efficiently mediate enhanced electromagnetic absorption in pristine semiconducting CNs and bipartite entanglement in hybrid metallic CN systems. We develop a theory for (non-linear) optical monitoring and control of the phenomena above.

\cite{1} I.V.Bondarev, JCTN7, 1673(2010).

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