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Plasmon Nanooptics with Pristine and Hybrid Nanotube Systems[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 (~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 [1,2]. Both of these collective excitations originate from the same electronic transitions and, therefore, occur at the same (low) energies ~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.

[1] I.V.Bondarev, JCTN7, 1673(2010).
[2] I.V.Bondarev, L.M. Woods, and K. Tatur, PRB80, 085407(2009).

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