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Surface Plasmon Generation by Excitons in Carbon Nanotubes[1]
IGOR BONDAREV, TODOR ANTONIJEVIC, North Carolina Central University
— Optical properties of semiconducting carbon nanotubes (CNs) originate from excitons and may be tuned by either electrostatic doping [1], or via the quantum confined Stark effect (QCSE) by means of an electrostatic field applied perpendicular to the CN axis[2]. In both cases exciton properties are mediated by surface plasmon excitations [2,3]. We have shown recently that the QCSE allows one to control the exciton-interband-plasmon coupling in individual CNs and their optical absorption, accordingly [2]. Here, we extend our studies to demonstrate the possibility of low-energy localized surface plasmon generation by optically excited excitons in small-diameter ($\sim$1nm) CNs. The stimulated character of such an energy transfer causes the buildup of the macroscopic population numbers of coherent localized surface plasmons and, as a consequence, high-intensity coherent optical-frequency fields localized at nanoscale, which can be used for various applications, such as near-field nonlinear-optical probing, sensing, or materials nanoscale modification. [1] M.Steiner, et al., NL9,3477. [2] I.V.Bondarev, et al., PRB80,085407. [3] C.D.Spataru and F.Leonard, PRL104,177402.

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Igor Bondarev
North Carolina Central University

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