Nanotube Plasmonics

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New universal plasmon related phenomena originating from the transverse quantization of electronic degrees of freedom in quasi-1D systems, will be discussed theoretically for small-diameter single wall carbon nanotubes exposed to external electromagnetic radiation, both in linear and in non-linear excitation regime. The effects discussed can manifest themselves both in individual semiconducting carbon nanotubes and in densely packed aligned nanotube films, both through plasmon enhanced inter-tube Casimir interactions and through the exciton-to-plasmon energy transfer tuned by a perpendicular electrostatic field applied. In the latter case, highly-intensive coherent localized surface fields plasmon-induced can be used in a variety of new tunable optoelectronic applications, such as near-field nonlinear-optical probing and sensing, optical switching, enhanced electromagnetic absorption, and materials nanoscale modification, with individual nanotubes and composite nanotube structures.

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