NANYANG TECHNOLOGICAL UNIVERSITY

The Photonics Institute

PAP Seminar Announcement

Quantum Plasmonics and Hot Carrier Induced Processes

By

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Date: 25 July 2016 (Monday)
Time: 5.00m - 6.00pm
Venue: MAS Executive Classroom 2 (SPMS-MAS-03-07)
Host: Prof Nikolay Zheludev

Abstract

Plasmon resonances with their dramatically enhanced cross sections for light harvesting have found numerous applications in a variety of applications such as single particle spectroscopies, chemical and biosensing, subwavelength waveguiding and optical devices. Recently it has been demonstrated that quantum mechanical effects can have a pronounced influence on the physical properties of plasmons. Examples of such effects is the charge transfer plasmon enabled by conductive coupling (tunneling) between two nearby nanoparticles and nonlocal screening of the plasmonic response of small nanoparticles. One relatively recent discovery is that plasmons can serve as efficient generators of hot electrons and holes that can be harvested in applications. The physical mechanism for plasmon-induced hot carrier generation is plasmon decay. Plasmons can decay either radiatively or non-radiatively with a branching ratio that can be controlled by tuning the radiance of the plasmon mode. Non-radiative plasmon decay is a quantum mechanical process in which one plasmon quantum is transferred to the conduction electrons of the nanostructure by excitation of an electron below the Fermi level of the metal into a state above the Fermi level but below the vacuum level. In particular I will discuss external control of charge transfer plasmons for active plasmonic devices, molecular plasmonics, hot carrier generation, decay and fluorescence, and hot carrier induced processes and applications such as photodetection, photocatalysis, and phase changing of nearby media.

Short Biography

Prof. Peter Nordlander (http://nordlander.rice.edu) obtained his PhD degree in Theoretical Physics at Chalmers University of Technology in Gothenburg in Sweden in1985. After postdoctoral positions at IBM Thomas J. Watson Research Center at Yorktown Heights (USA) and AT&T Bell Laboratories at Murray Hill (USA) and at Rutgers University, he joined the faculty at Rice University in 1989 and is currently Wiess Chair of Natural Sciences and Professor of Physics and Astronomy, Professor of Electrical and Computer Engineering and Professor of Materials Science and Nanoengineering. He has been a Visiting Professor at University of Paris, at the Institute of Physics at the Chinese Academy of Sciences, and is presently a visiting professor in the Department of Physics at Peking University and at Wuhan University. His research background is in theoretical condensed matter and nanophysics. His current research is focused on the theoretical and computational modeling of Plasmonics and Nanophotonics phenomena. He is an associate editor of ACS Nano. He is a fellow of APS, AAAS, SPIE, OSA, and MRS and is the recipient of the 1999 Charles Duncan Award for Outstanding Academic Achievement (Rice), the 2013 Willis E. Lamb Award for Laser Science and Quantum Optics, the 2014 Frank Isakson Prize for Optical Effects in Solids, the 2015 R. W. Wood Prize for Optics, and is a Thomson-Reuters Highly Cited Researcher

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