北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

The fascinating properties of nanocavity plasmon

Yi Luo

Hefei National Laboratory for Physical Sciences at the Microscale
University of Science and Technology of China (USTC), China

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Venue: Room w563, Physics building, Peking University

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Abstract

A metallic nanocavity can squeeze the visible light into highly confined intensive nanocavity plasmon (NCP) with a broad energy distribution. Such a unique excitation source can lead to many exciting new applications. I will present here our several new exciting findings from the use of NCP. Our combined theoretical and experimental studies reveal that the NCP acts like a tunable, strong and ultra-fast electromagnetic source that can naturally alter the color of the emission of a molecule[1,2]. The amplified light emission of the molecule enables us to image the coherent dipole-dipole interaction between molecules[3]. Moreover, we predicted and verified that the NCP can also produce a completely new physical process, namely the nonlinear inelastic electron scattering[4]. A new theory that takes into account the locality of the highly confined field to describe the light-matter interaction has been developed[4], which has successfully reproduced experimentally observed super high spatial resolution Raman images of a molecule, below one nanometer [5]. It is found that the non-resonant Raman images should be capable of revealing the vibrational modes of the molecule in real space[4b]. The breakdown of the dipole and spin selection rules for molecular excitations will also be discussed.

References:

1. Z.C. Dong, et al. Nature Photonics, 4 (2010) 50
2. G.J. Tian, et al., Phys. Rev. Lett., 106 (2011) 177401; G.J. Tian, et al., Angew. Chem. Int. Ed., 52 (2013) 4814
3. Y. Zhang, et al., Nature, 531 (2016) 623
4. C.K. Xu, et al. Nature Physics, 10 (2014) 753.
5. S. Duan, et al., J. Am. Chem. Soc., 137(2015) 9515; S. Duan, et al., Angew. Chem. Int. Ed., 128 (2016) 1053.
6. R. Zhang, et al. Nature, 498 (2013) 82; S. Jiang, et al. Nature Nanotechnology, 10, (2015) 865

About the speaker

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2008 2009 973 2010-2014

1996 1997 2000 2000 3

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“ Goran Gustafsson” 2014 “ ” Nature,

Nature , PNAS, PRL, JACS 390 H 51