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

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Time: 4:00pm, Dec. 21, 2016 (Wednesday)

时间：2016年12月21日 （周三）下午4:00

Venue: Room w563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

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

罗毅，男，中国科学技术大学教授、博士生导师，现任合肥微尺度物质科学国家实验室常务副主任；首批“千人计划“入选者（2008）和国家特聘专家，国家杰出青年基金获得者（2009），国家重大科学研究计划项目（973）首席科学家（2010-2014）。1996年获瑞典林雪平大学计算物理博士学位。1997－2000年在瑞典斯德哥尔摩大学任助理教授。 2000年3月至今任瑞典皇家理工学院副教授、教授和兼职教授。由于在分子、纳米、生物光子学与电子学以及X 射线科学等方面所作出的显著贡献，获得2010年瑞典皇家科学院“Goran Gustafsson”化学奖，2014年作为主要完成人之一获中国科学院“杰出科技成就集体奖”。在Nature, Nature 子刊, PNAS, PRL, JACS等国际学术期刊发表论文390多篇，被引一万多次，H 因子51。