# 学术报告

题 目: Plasmon-mode Engineering for Nanoplasmonic Sensing --From Fano-like interference to superscattering with a single metallic nanodisk

报告人: Dr. Wenwei Zheng
University of California, San Diego, USA

时 间: 11 月 15 日（周六）上午 10: 00

地 点: 卢嘉锡楼报告厅（202）

欢迎参加!

固体表面物理化学国家重点实验室
化学化工学院
11 月 11 日

# *Plasmon-mode Engineering for Nanoplasmonic Sensing*

## --From Fano-like interference to superscattering with a single metallic nanodisk

Dr. Wenwei Zheng
Center for Theoretical Biological Physics & Department of Physics,
University of California, San Diego, USA

时间：2014 年 11 月 15 日(星期六) 上午 10:00
地点：卢嘉锡楼报告厅（202）

## Abstract:

Modern study of biological systems increasingly depends on our ability to dynamically and quantitatively measure molecular processes with high sensitivity, selectivity, and multiplexity in complex environments.1 Biomaterials have unique recognition and catalytic properties whereas plasmonic nanomaterials exhibit unique electronic and photonic properties that provide electronic or optical transduction of biological phenomena. Their integration yields plasmonic nano-bio hybrid sensors with multiple synergetic advantages over traditional molecular sensing techniques: improved sensitivity, selectivity, and capability of various surface-enhanced spectroscopic sensing. However, nanoplasmonic sensing is mostly based on single dipole mode. Therefore, the broad width of dipolar mode resonance confines figure of merit in plasmonic refractometric sensing. Moreover, the low electric near-field intensity of single dipolar mode limits enhancement in surface-enhanced plasmonic sensing. In this talk, I would like to discuss how high-order localized plasmon modes and their interaction with dipole modes enable optical properties of a single metallic nanodisk to vary from Fano-like resonances to superscattering. Furthermore, I will show how such plasmon-mode engineering can benefit nanoplasmonic sensing2, 3 and discuss some future directions for multiplexed nanoplasmonic biosensing4 (e.g. interaction of plasmonic modes with vibrational modes of biomaterials for surface-enhance vibrational spectroscopy).

## Reference

1. Zheng, W.; Chiamori, H. C.; Liu, G. L.; Lin, L.; Chen, F. F., Nanofabricated plasmonic nano-bio hybrid structures in biomedical detection. *Nanotechnology Reviews* 2012, 1.

2. Wan, W.; Zheng, W.; Chen, Y.; Liu, Z., From Fano-like interference to superscattering with a single metallic nanodisk. *Nanoscale* 2014, 6, 9093-9102.

3. Ruan, Z. C.; Fan, S. H., Superscattering of Light from Subwavelength Nanostructures. *Phys. Rev. Lett.* 2010, 105.

4. Wu, C.; Khanikaev, A. B.; Adato, R.; Arju, N.; Yanik, A. A.; Altug, H.; Shvets, G., Fano-resonant asymmetric metamaterials for ultrasensitive spectroscopy and identification of molecular monolayers. *Nat Mater* 2012, 11, 69-75.

# *Plasmon-mode Engineering for Nanoplasmonic Sensing*

## --From Fano-like interference to superscattering with a single metallic nanodisk

Dr. Wenwei Zheng
Center for Theoretical Biological Physics & Department of Physics,
University of California, San Diego, USA

时间：2014 年 11 月 15 日(星期六) 上午 10:00
地点：卢嘉锡楼报告厅（202）

报告人简介:

Dr.Wenwei Zheng is currently a visiting scholar in Department of Physics, University of California, San Diego, working on application of plasmonics in biology and medicine. In 2001, Wenwei received his B.Sc. in both chemistry and physics from Peking University, China. From Stanford University, he obtained his M.Sc in Chemistry in 2004 and Ph.D. in Biophysical Chemistry in 2010. In 2010-2011, he worked as a postdoctoral researcher at University of California, Berkeley and Life Science Division of Lawrence Berkeley National Laboratory. In 2011-2013, he worked as a postdoctoral researcher in Department of Electrical and Computer Engineering at University of California, San Diego. His expertise lies in biomedical application of nanoplasmonic-bio hybrid materials and surface-initiated vapor deposition polymerization of polypeptides.