

University of Macau

Faculty of Science and Technology

Institute of Applied Physics and Materials Engineering

Ref: FST/RTO/0151/2015

Nanomaterials in Energy Conversion and Environmental Sensing

By

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and

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Date: 7 October 2015 (Wednesday)

Time: 11:00a.m.

Venue: E11- 4045

Abstract

Due to their unique surface and structural properties, nanomaterials are recognized for their wide applications in energy conversion, environmental catalysis, and chemical and biological sensing. This talk will present recent advances in nanomaterials research and its novel applications including: (1) non-compensated n-p codoping of titanium dioxide (TiO₂) for improved visible light absorption in solar energy utilization and (2) the fabrication of suspended nanoantenna arrays for ultra-sensitive surface enhanced Raman spectroscopic (SERS) detection of chemical and biological agents. The concept of non-compensated n-p codoping is demonstrated quantitatively within first-principles

density functional theory and validated by experimentally determined bandgap narrowing, red-shifted optical absorbance, and enhanced photoactivity manifested by efficient hole-electron separation in the visible spectral region. The use of novel suspended gold nanoparticle arrays capable of generating plasmonic nanocavities enabled reproducible, ultra-sensitive detection of a range of chemical and biological agents. Large electromagnetic field enhancement has been realized within the gap region of noble metallic nanostructures serving as a plasmonic nanoantenna. These findings shed new light on the rational design of the photocatalysts for solar energy conversion and SERS substrate materials for chemical, biological and environmental sensing.

Biography

Prof. Gu is a Distinguished Senior Scientist in the Environmental Sciences Division at Oak Ridge National Laboratory. He also holds a joint appointment as Professor at the University of Tennessee, Knoxville. He received his Ph.D. from the University of California, Berkeley in 1991 and his M.Sc. from the University of British Columbia in 1986. Prof. Gu is the author and/or co-author of over 250 journal publications, books or book chapters, with an H-Index of 57 and over 10,000 citations. His major research interests include nanomaterials research and environmental applications, Raman sensor and spectroscopic studies, biogeochemical transformation of soil carbon, contaminant metals and radionuclides.

All are Welcome!