演講公告

國立清華大學
材料科學工程學系
Department of Materials Science and Engineering

時間：12 月 7 日(週三) 下午 1:30~3:30

地點：本校材料科技館 511 教室

主講者：

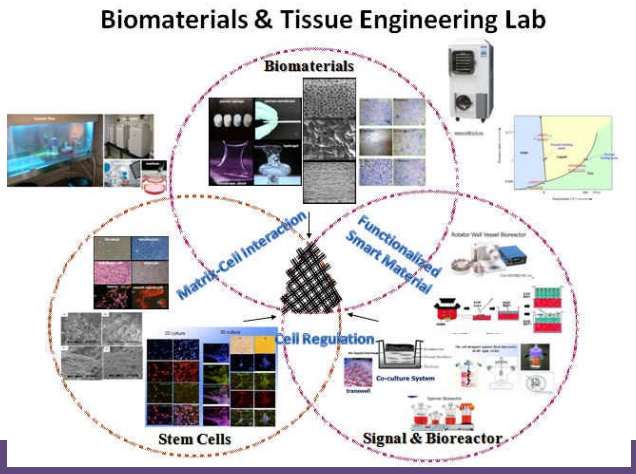
萬德輝教授

清華大學生物醫學工程研究所

演講題目：

奈米金屬/高分子複合材料之光學性質與生醫應用

Optical Properties and Biomedical Applications of Metal Nanoparticle/Polymer Composites



邀請人：王子威教授 #33856

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摘要:

Gold nanostructures have proven to be a versatile platform for a broad range of optical applications. They are attractive for their surface plasmon resonance (SPR) properties. The strong interactions between metallic nanoparticles (NPs) and incident light originate from excitation of the collective oscillations of conduction electrons within these particles. In this talk, I will introduce our recent work on the fabrication of gold nanostructures/polymer composites, and their optical properties and applications.

First part describes a systematic investigation of the phenomenon of white light–induced heating in silk fibroin (SF) films embedded with gold nanoparticles (Au NPs). The Au NPs functioned to develop an ultrahigh broadband absorber, allowing white light to be used as a source for photothermal generation. Upon increasing the Au content in the composite films, the absorbance was enhanced significantly around the SPR wavelength, while also increasing dramatically at non-SPR wavelengths. The optimized composite film exhibited ultrahigh absorbances of approximately 95% over the spectral range from 350 to 750 nm, with moderate absorbances (>60%) at longer wavelengths (750–1000 nm). As a result, the composite film absorbed almost all of the incident light and, accordingly, converted this optical energy to local heat.

Second part illustrates a SPR-based scattering waveguide sensor by directly imprinting monolayer Au NPs onto flexible polycarbonate (PC) plates—without any surface modification—using a modified reversal nanoimprint lithography (rNIL) technology. Controlling the imprinting conditions, including temperature and pressure, allows for the fine adjustment of the depths of the embedded metal NPs and their SPR properties. This patterning approach exhibits a resolution down to the submicrometer level. We obtained an almost one order of magnitude enhancement in the scattering signal after transferring the metal NPs from a glass mold to a PC substrate.

Keywords： surface plasmon resonance, nanoparticles, silk fibroin, nanoimprinting, photo-detectors, chemical sensing

邀請人 ： 王子威教授 #33856