

10<sup>th</sup> International Conference and Exhibition on

# BIOSENSORS & BIOELECTRONICS

September 21-22, 2018 | Dallas, USA



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### Applications of metallic nanoparticles in biosensors and bioelectronics

Recently there is considerable interest to study metallic nanoparticle for the application of biosensors and bioelectronics. Noble-metal nanoparticles are known to enhance emission rates of quantum emitters (QEs) significantly by decreasing their radiative lifetime and increasing their quantum yield. The enhancement of the emission in QEs such as molecular fluorophores is a highly useful strategy for improving detection sensitivity and selectivity in many emerging applications in biosensors and bioelectronics and DNA screening. Recently, there is considerable interest to study hybrid systems made of biocompatible fluorescent molecules and metallic double nanoshells (DNSs) for biomedical imaging and for the detection of disease markers in the near-infrared wavelength region. The penetration depth of near-infrared light is large in most biological media. It is found that these hybrids have large absorption coefficients and high quantum yields in the far-infrared region. Here we study the light emission from the quantum emitter and double metallic nanoshell hybrid systems. Quantum emitters act as local sources which transmit their light efficiently due to double nanoshell near field. The double nanoshell consists of a dielectric core and two outer nanoshells. The first nanoshell is made of a metal and the second spacer nanoshell is made of a dielectric material or human serum albumin. We have calculated the fluorescence emission for a quantum emitter-double nanoshell hybrid when it is injected in an animal or human body. The outer spacer nanoshell of double metallic nanoshells consists of silica and human serum albumin with variable thickness. We find that the thickness of the spacer nanoshell layer increases the enhancement when the fluorescence decreases. The enhancement of the fluorescence depends on the type of quantum emitter, a spacer layer and double nanoshell. We also found that the peak of the fluorescence spectrum can be shifted by changing the shape and size of the nanoshell. The fluorescence spectra can be switched from one peak to two peaks by removing the degeneracy of excitonic states in the quantum emitter. Hence using these properties, one can use these hybrids as biosensing and switch devices for applications in bioelectronics.

### Biography

Mahi R Singh working as a professor since 1985 at The University of Western Ontario which is one best and largest Universities in Canada. He was a Royal Society Professor at Oxford University and worked in High Magnetic Lab in Toulouse. He was Chief researcher at Hitachi Research Lab in Tokyo. He also worked at McGill University, Montreal with P.R. Wallace who invented Graphene theoretically in 1947. He have very active research group and have produced many graduate students/postdocs who are professors all over the world. He have international theoretical and experimental collaborations in US, UK, Spain, Italy, Sweden, China, Germany, India, Egypt, Argentina and Mexico. For example, He is developing collaboration with Klaus von Klitzing and he is visiting him next summer. Recently he have organized about 16 international conferences and hosted three Nobel Laureates (Klitzing, Leggatt and Yonah). He has been invited as plenary and invited speaker throughout the world. Since 2003, he has presented about 100 public, plenary and invited talks in many international conferences and universities in the world. He has published about 300 papers and 10 books in condensed matter physics, optoelectronics, plasmonics, nanophotonics, nanomaterials, nano-hybrids and metamaterials.

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