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Gold nanorods in biological imaging and sensing

Yu Chen, Y Zhang and D J S Birch
Strathclyde University, UK

Intrinsic luminescence from gold nanoparticles has attracted intensive interest in recent years. It combines with high photostability, low toxicity, tunable absorption band and ability to conjugate to bio-molecules, making gold nanoparticles a versatile probe in biological imaging and sensing. The two-photon luminescence (TPL) from gold nanorods (GNRs) were studied and it was found that their characteristic short lifetime (less than 100ps) can be used to distinguish gold nanorods from other fluorescent labels and endogenous fluorophores in lifetime imaging. In addition, surface plasmon enhanced energy transfer was observed between biological labeling dyes and gold nanorods under two-photon excitation in both solution and intracellular phases. These studies demonstrated that gold nanoparticle-dye energy transfer combinations are appealing, not only in Fluorescence Resonance Energy Transfer (FRET) imaging, but also energy transfer-based fluorescence lifetime sensing of bio-analytes. Internalization of GNRs has been studied via FRET based fluorescence lifetime imaging using GFP labelled early endosome. Observed energy transfer between GNRs and GFP indicates the involvement of endocytosis in GNR uptake. Finally, a novel nanoprobe based on gold nanorod for nucleic acid sensing has been developed. Drastic recovery of fluorescence intensity and distinctive changes in fluorescence lifetime has been observed after hybridization of nanoprobe with targeting oligonucleotide in vitro. Two-photon FLIM images clearly show the uptake of nanoprobe by tumour cells, suggesting the potential in cancer diagnosis and prognosis.

Biography

Yu Chen completed her PhD from Birmingham University in Nanoscale Physics and is a senior Lecturer in Strathclyde University. Her research focuses on the unique physical and chemical properties of nanoscale structures, utilizing both optical and electron microscopy and spectroscopy, surface plasmon enhanced effect, two-photon luminescence, energy transfer and SERRS from noble metal nanoparticles, arrays and porous media, with strong links to biomedical imaging and sensing. She serves as an expert panel member for the European Cooperation in Science and Technology, an editorial board member of Sample of Science, and a committee member for a number of international conferences.

y.chen@strath.ac.uk