Angela Demetriadou, J Phys Chem Biophys 2014, 4:5
http://dx.doi.org/10.4172/2161-0398.S1.006

OMICS Group Conferences
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2nd International Conference and Exhibition on
Lasers, Optics & Photonics
September 08-10, 2014 Hilton Philadelphia Airport, USA

Characterizing and imaging nanoparticles with surface plasmon polaritons

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Surface Plasmon Polaritons (SPPs) are surface waves bound and propagating on a metal-dielectric interface. They are widely used for sensing purposes, such as investigating bio-molecular interactions and for medical diagnostics. Recently though, it was shown that SPP waves can, not only detect, but actually image in real-time single isolated sub-wavelength nanoparticles diluted in liquid solutions. This real-time imaging technique has the potential to replace standard probe methods, such as Scanning Tunnelling Microscope (STM) and Atomic Force Microscope (AFM), since it is both not perturbative and label-free. A theoretical model was developed that explains the image formation using SPPs. It was found that the diffraction caused by the nanoparticle, locally decouples the SPP-wave from the metal-dielectric interface. Hence, a local increase to the reflected beams's intensity emerges (i.e., the plasmonic image of the nanoparticle). Using our theoretical model, the characteristics of the plasmonic image in both the near- and far-field regions was quantified and hence the nanoparticles were characterized from their plasmonic image.

Biography

Angela Demetriadou has completed her PhD in 2010 from the Department of Physics, Imperial College London and Postdoctoral studies from Queen Mary College (University of London), University of Surrey and Imperial College London. She is currently a Research Associate at the Physical Chemistry group (Dept. Chemistry), Imperial College London. Her research interests lie in the fields of nano-plasmonics, metamaterials, optical chirality, sub-wavelength imaging, non-linear and active plasmonic structures.

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