SPATIAL LIGHT SWITCHING FOR LOCALIZATION-BASED SURFACE PLASMON MICROSCOPY

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Optical molecular imaging techniques based on switchable light localization are described. The creation of locally amplified electromagnetic near-fields on surface plasmon-enhanced metallic nanoarray structures has been investigated in many studies because of the potential for extreme light confinement to improve molecular detection sensitivity and resolving power for imaging processes that would be typically impossible to observe under the diffraction limit. Although many emerging microscopy approaches have been highly successful to produce super-resolved image resolution, we explore alternative techniques based on plasmonic nanoarrays by which achievable resolution may be customized to fit specific imaging needs. Feasibility studies performed on visualizing internalization of virus particles, sliding microtubules, bacterial motility, and mitochondrial movement on random and periodic plasmonic nanoaperture patterns were reported [1]. Enhancement of axial resolution for the detection of intracellular protein distribution is reported by extraordinary light transmission using linearly graded plasmonic nanoapertures. Switching-based light localization is also investigated to circumvent the diffraction limit of far-field optics under Rayleigh criterion, thereby implement full-field super-resolution microscopy. Localization switching can be used to improve image resolution of label-free surface plasmon microscopy (as shown in Figure 1), which suffers from plasmon scattering in conventional set-up [2]. Improvement of surface coverage of localized fields is discussed using random nanocomposite islands for light switching.

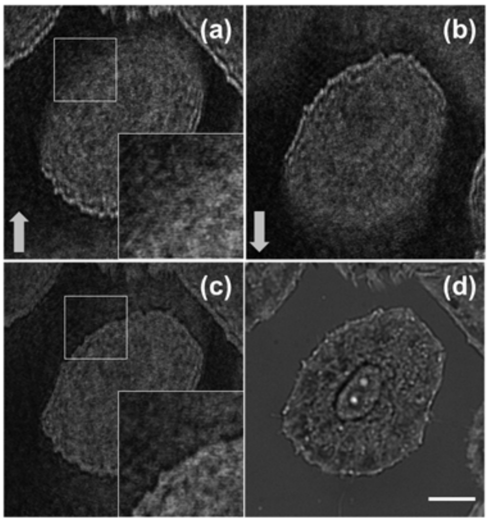

Figure 1: (a-b) Conventional and (c) switched surface plasmon microscopy images of a cell. (d) Bright-field image (scale bar: 10 μm)

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