

SURFACE PLASMON MICROSCOPY WITH A CONFOCAL DETECTION SYSTEM

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Surface plasmon microscopy [1] is a technique to visualize transparent objects on a metallic surface via local refractive index measurements. It has been revealed that the technique provides high contrast to adsorbed bio-related molecules/objects such as proteins, lipids, and viruses without labeling. [2] In this presentation, we report a modified optics that employs a confocal detection system in order to increase its applicability against smaller objects.

Figure 1 shows an optical setup of the microscope. A ring-patterned light-distribution having radial polarization is given at the entrance pupil of an oil-immersion objective lens. The light is converted to a 0th order Bessel (J_0) beam and illuminates a substrate that is fabricated as Kretschmann configuration (glass/metallic thinfilm/dielectric sample.) The intensity of reflected light from the substrate is measured by a point detector that is located at the imaging plane of the metallic thinfilm. By using this setup, coupling efficiency of the illumination light to the localized surface plasmon is obtainable from reflected intensity.

Figure 2 shows a calculated point spread function (PSF) of the confocal surface plasmon microscope. In this calculation, product of an amplitude distribution of the illumination light and an amplitude image of a point detector is calculated by assuming the use of radially polarized light with a wavelength of 632.8nm, a gold thinfilm with a thickness of 47.45nm, and air as environment of measurement for the setup. The full width at half maximum was improved by 31.9% by the confocal detection system.

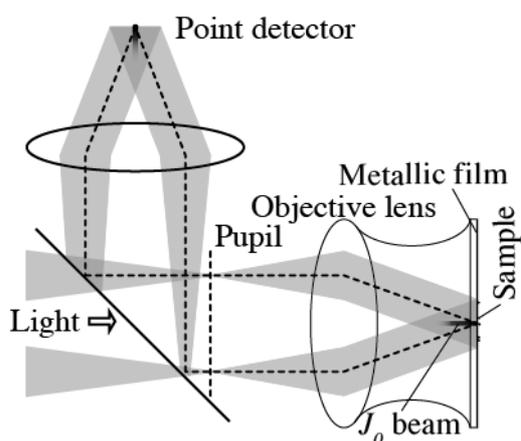


Figure 1. Optical setup for surface plasmon microscopy with a confocal detection system.

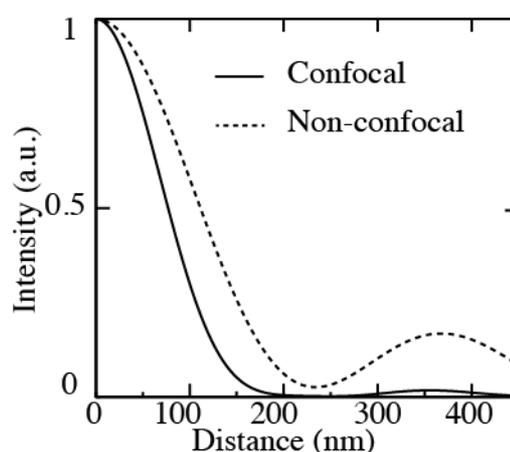


Figure 2. PSF profiles of confocal and non-confocal surface plasmon microscopes.

- [1] H. Kano *et al. Opt. Commun.* **182**, 11-15 (2000).
[2] K. Toma *et al. ACS Nano.* **8**, 12612-12619 (2014).