Light Localization on a Gold Nanodisk Array Probed by Near-Field Optics

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By near-field optics, we have studied the localization of light on an array of metallic nanoparticles illuminated in a transmission mode. The array is made of 286 nm-wide and 50 nm-high gold nanodisks with a period of 500 nm. The SNOM probe is a fluorescent particle which detects the near-field on the surface. We will show that the measured local field is situated between adjacent nanodisks and in a direction parallel to the polarization of the incident light. By performing scans in a direction perpendicular to the surface, we have also observed that the light intensity strongly decays above the sample surface showing a 3D localization. All the experimental results are in very good agreement with numerical simulations performed by the FDTD method and by taking into account the size of the near-field probe.

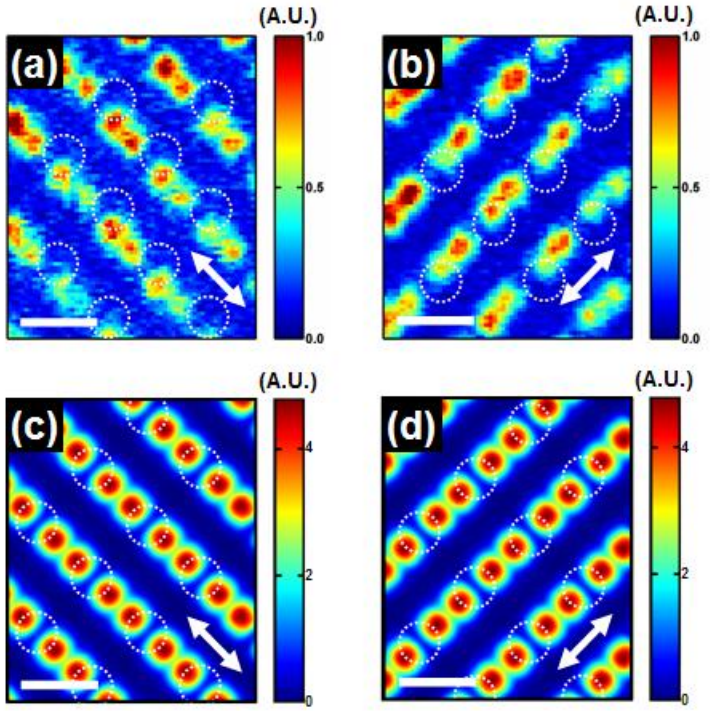

Figure 1: (a,b) SNOM images measured in a non-contact mode on the nanodisk array at a wavelength of 975 nm. The dotted circles indicate the position of the disks. (c,d) FDTD calculations of the near-field distribution on the structures. The calculation represents the square of the intensity of the total field which is the quantity measured with the near-field fluorescent probe used in the experiments. The calculations has been performed by taking into account of the probe size (a 160 nm large cube).The white arrows indicate the incident polarization direction. The scale bar is 500 nm-long.