Plasmonic Sensing via Photoluminescence of Individual Gold Nanorod

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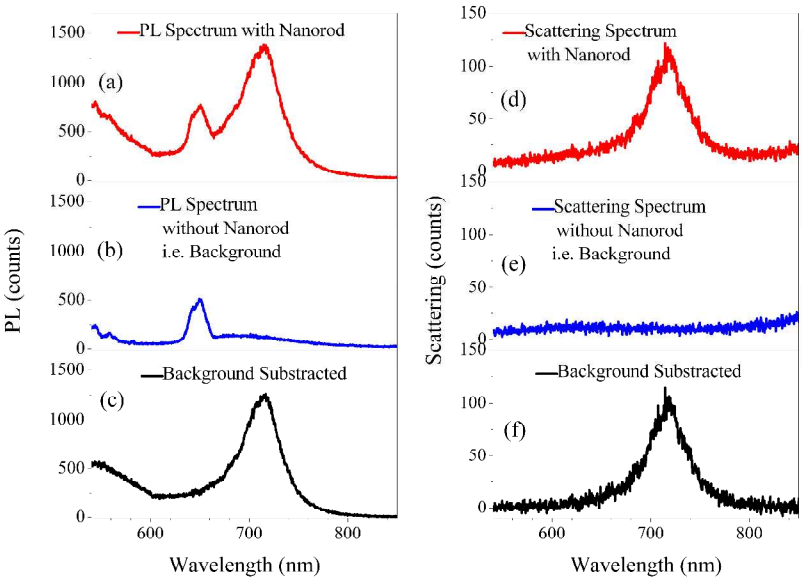

Figure S1. Left: typical photoluminescence (PL) spectrum of single nanorod in water. (a) Original PL spectrum in the presence of a single nanorod; (b) the PL background in absence of the nanorods presumably due to the excitation stray light and the Raman of the water; and (c) background-subtracted PL spectrum of sing nanorod. Right: (d), (e), (f) typical scattering spectra of the same nanorod as indicated. Here, a tungsten halogen lamp was used as total internal reflection light source. The excitation

power (wavelength=532nm) for the PL measurements was around 200 μW and the measurement was carried out in PBS solution.

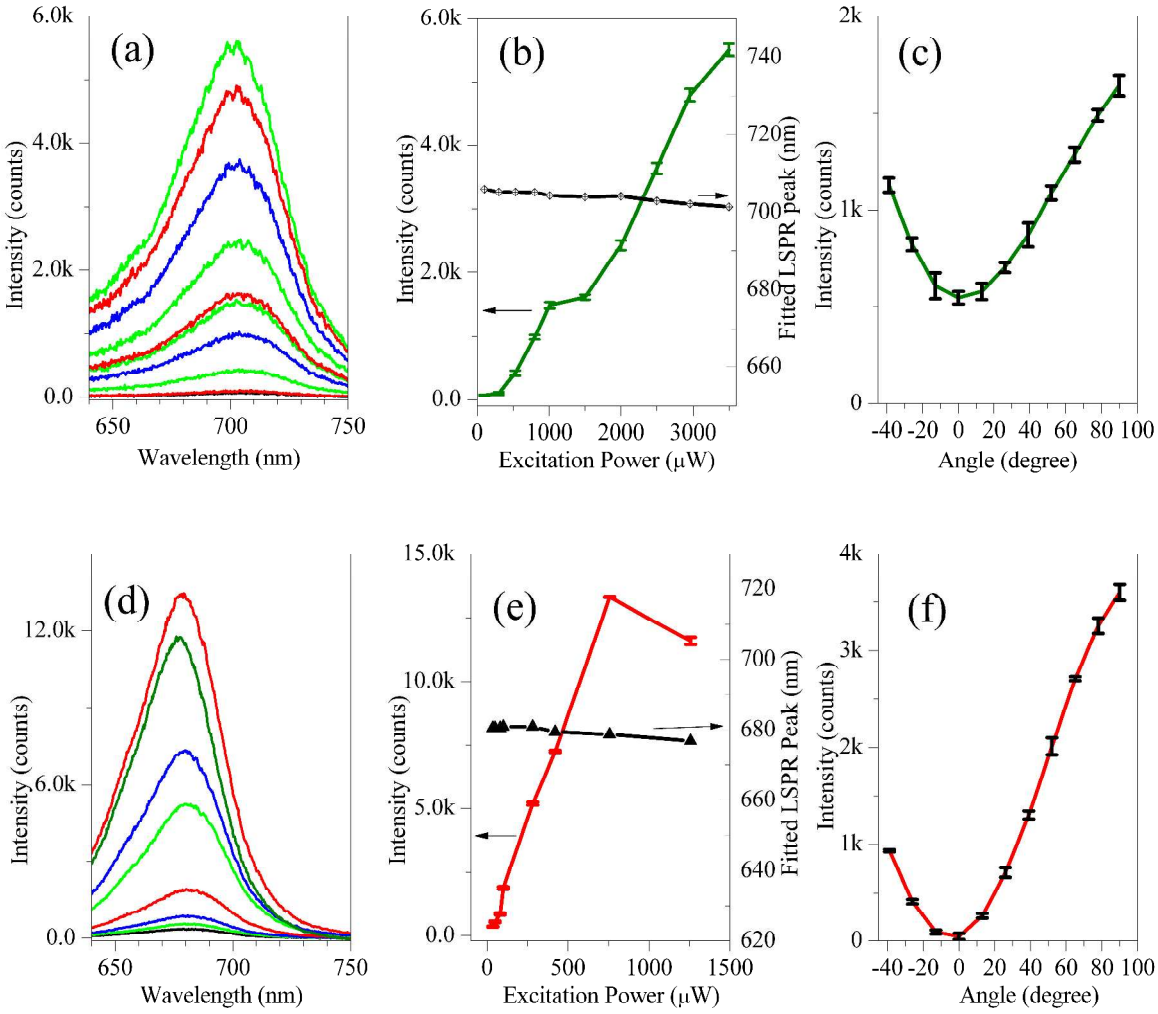

Figure S2. Photoluminescence spectra of single nanorod excited by 532 nm (top) or 633 nm (bottom) laser respectively. ((a) excited by 532nm laser; (d) excited by 633nm laser). As excitation power increases, the spectrum peak shifts gradually to short wavelength and remains stable under certain power; b) and e) The line graph of (a) and (d) as can be seen more clearly, the peak value shifts to shorter wavelength and the PL intensity increase as the increase of excitation power, and the deviation of peak maximum under low excitation power is quite small (less than 1 nm); c) and f) polarization dependence of the same nanorod excited by 532 nm (top) or 633 nm (bottom) laser respectively. The measurements were carried out in PBS solution.

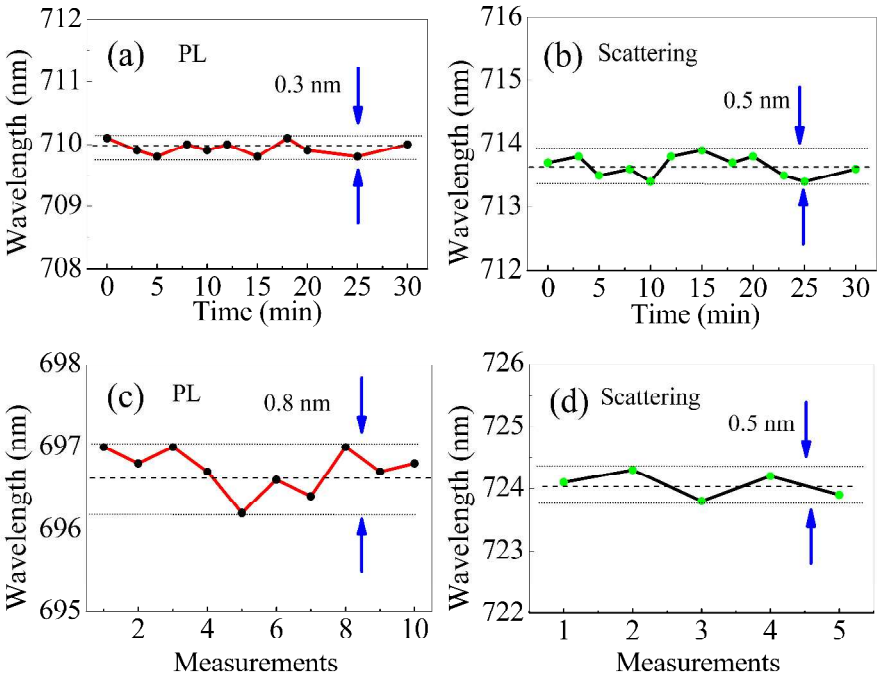

Figure S3. The detection limit and noise level of the optical system. Top: the noise level of the PL (a) and scattering (b) peak fitted centroid of time traces (the excitation laser or white light spot was fixed at individual nanorod, and the spectra were recorded at different time), the noise level of the PL is lower than that of optical scattering because of the higher signal to noise ratio of the PL spectrum. Bottom: the deviation of PL (c) and scattering (d) peak fitted centroid for different measurement (the focus of objective were moved between a few nanoparticles, and the spectra (measured in different rounds) of the same gold nanorod were compared, and the light spot was placed where the intensity was highest each time. The noise level is almost the same for the scattering spectra probably because of its large illumination area, but the deviation of the PL spectra increase obviously probably because of the tight focusing excitation spot by a oil immersion high numerical aperture objective.

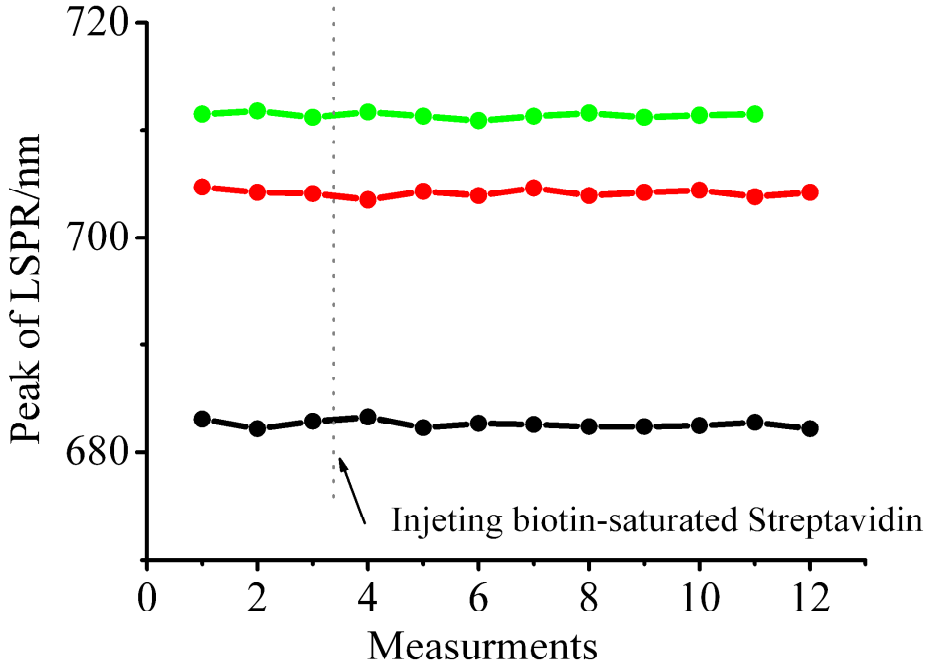

Figure S4. Typical curves of control experiments for three different biotin functionalized nanorods. The dots line indicates the injecting of biotin-saturated streptavidin, there was no obvious red-shift in the PL spectral peak upon incubation with the biotin-saturated streptavidin.

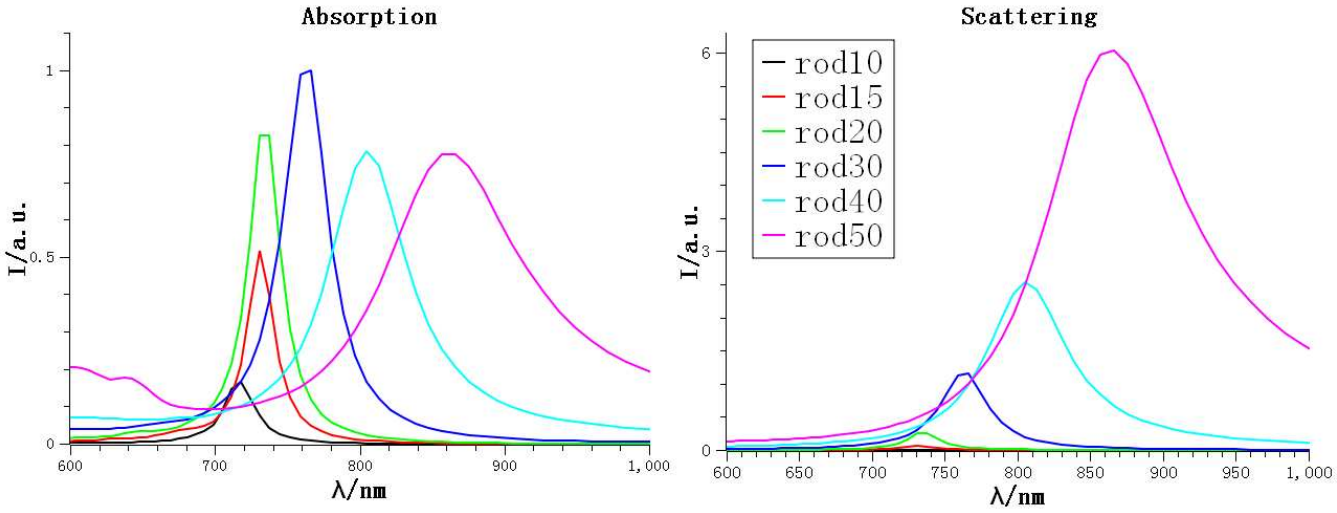

Figure S5. Absorption (left) and scattering (right) spectra of the gold nanorods with different size calculated by FDTD method. The diameters of nanorods are varied from10 nm to 50 nm, and the aspect ratios (length vs. diameter) are identical fixed at 3 for all nanorods. The mesh size is 1 nm during the calculations.