Electronic Supplementary Information

Highly enhanced transverse plasmon resonance and tunable double Fano resonances in gold@titania nanorods

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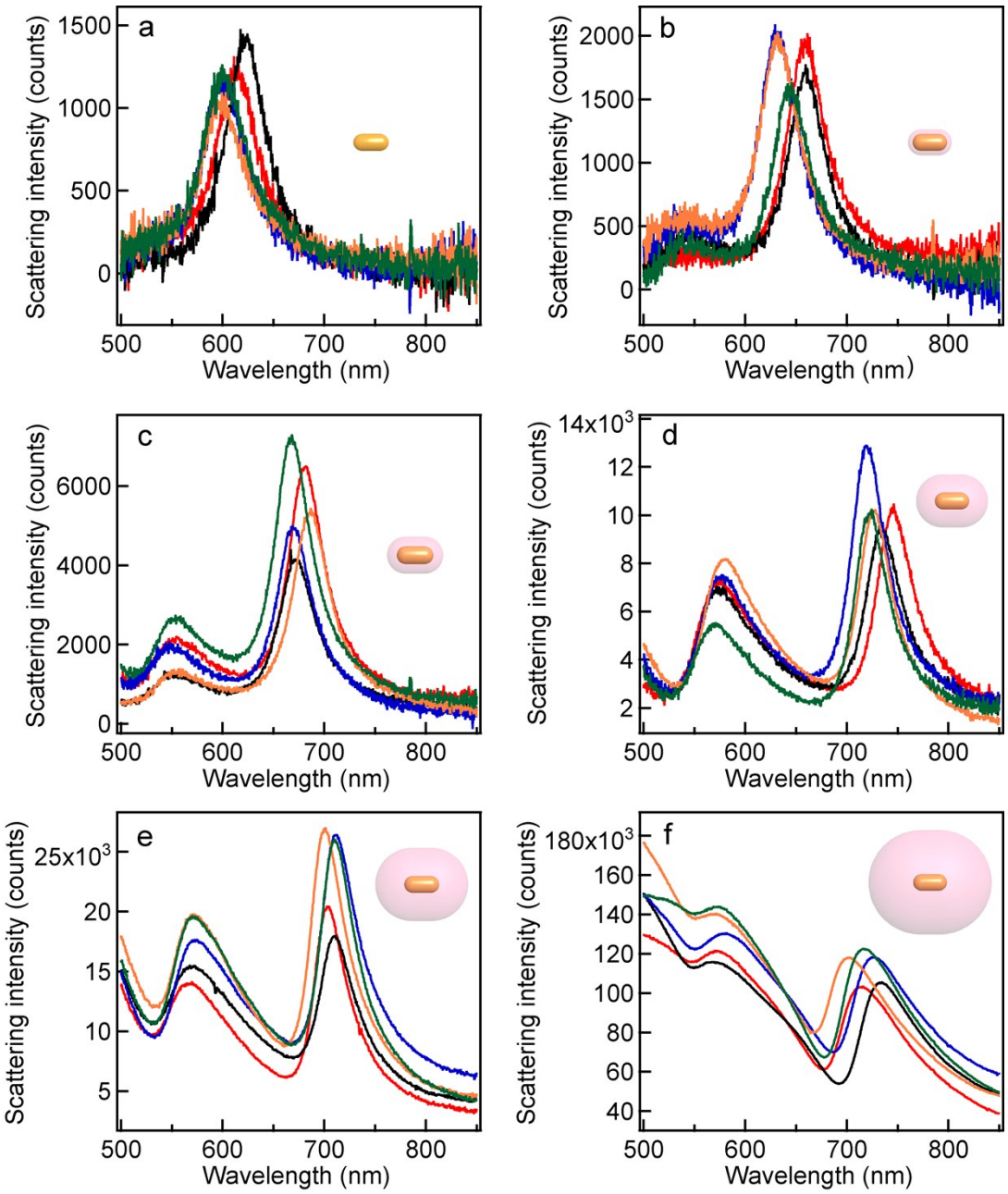

Fig. S1 Single-particle scattering spectra of the uncoated Au nanorod and Au@TiO_2 nanorod samples. (a) Au nanorods. (b–f) Au@TiO_2 nanorod samples with shell thicknesses of 12 ± 2, 20 ± 2, 43 ± 4, 59 ± 6 and 104 ± 10 nm, respectively. The insets are the structural illustrations of the corresponding nanorods.

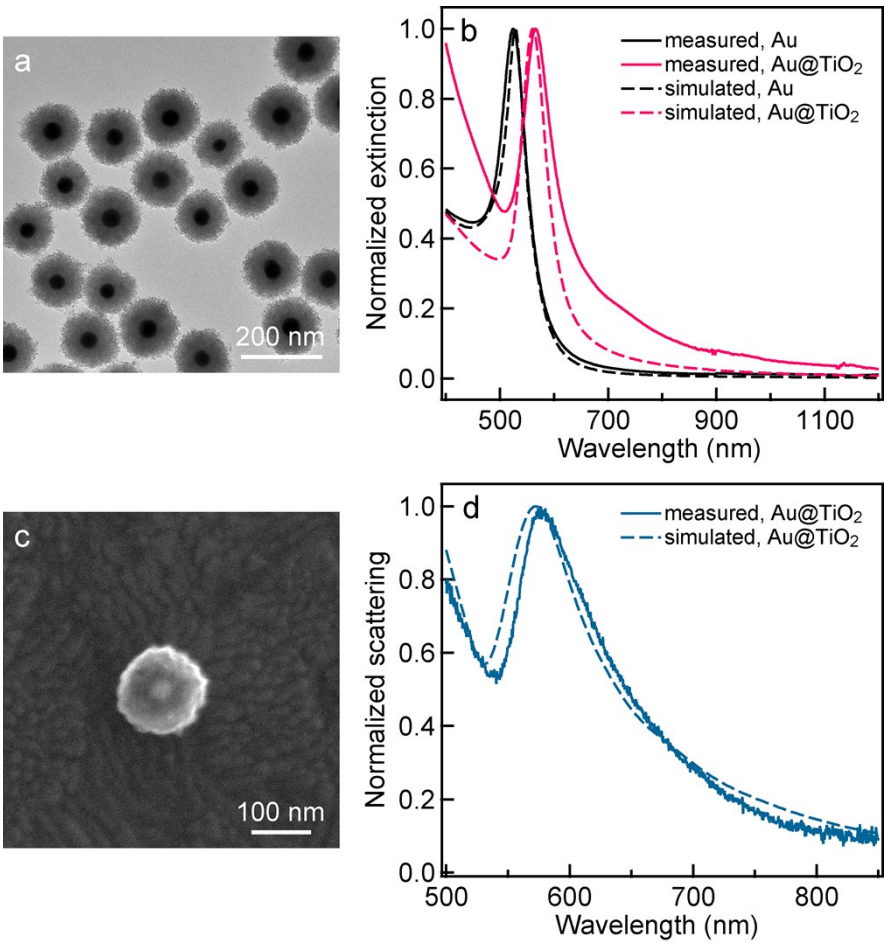

Fig. S2 Analyses on the Au@TiO_2 nanospheres. (a) TEM image of the Au@TiO_2 nanosphere sample. The average diameter of the Au nanosphere cores and the average thickness of the TiO_2 shell are 41 ± 3 nm and 49 ± 4 nm, respectively. (b) Measured and simulated extinction spectra of the uncoated Au nanosphere and Au@TiO_2 nanosphere samples. (c) SEM image of a representative Au@TiO_2 nanosphere. (d) Measured and FDTD-simulated scattering spectra of the Au@TiO_2 nanosphere. The spectra in (b) and (d) are normalized for the purpose of comparison. In the FDTD simulation of the scattering spectrum in (d), the Au@TiO_2 nanosphere was placed on the ITO substrate. The diameter of the Au nanosphere core was set at 41 nm, and the thickness of the TiO_2 shell was set at 49 nm. The ITO substrate was also taken into account, with its refractive index set at 1.9. The index of the surrounding ambient environment was set at 1.0.

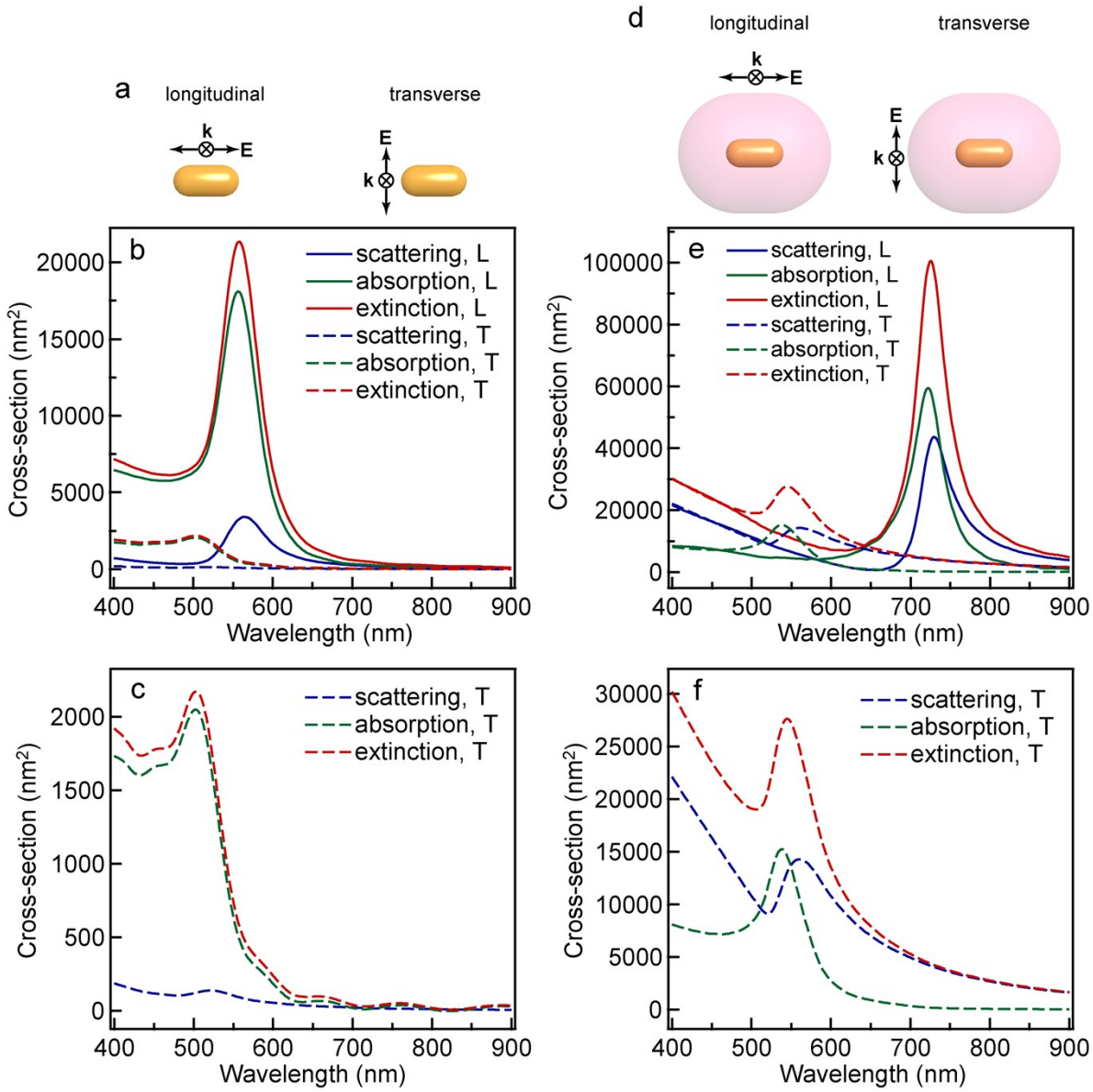

Fig. S3 FDTD-simulated scattering, absorption and extinction spectra of the uncoated Au nanorod and Au@TiO_2 nanorod. (a) Schematics illustrating the setups of the light source for the longitudinal and transverse excitations, respectively. (b) Simulated scattering, absorption and extinction spectra of the Au nanorod with either the longitudinal (L) or transverse (T) excitation. The spectra for the transverse excitation are magnified in (c). (d–f) Similar data for the Au@TiO_2 nanorod with a shell thickness of 60 nm.

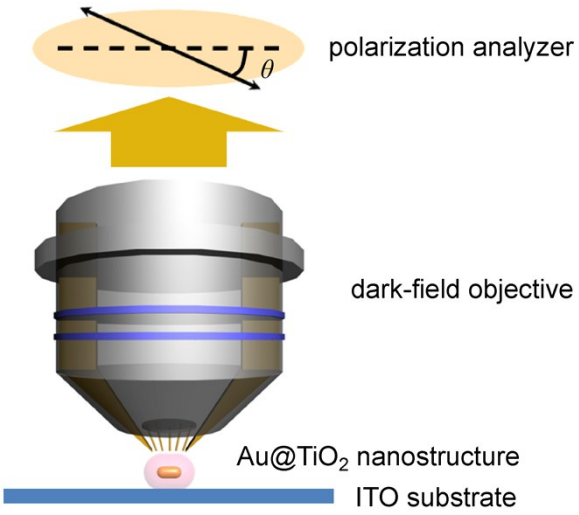

Fig. S4 Schematic illustrating the setup for measuring the polarization-dependent scattering spectra of the individual Au@TiO_2 nanorods.

Table S1 Parameters obtained from fitting the FDTD-simulated scattering spectra of the Au@TiO_2 nanorods with the coupled oscillator model

	ω_1 (eV)	ω_2 (eV)	v_{12} (eV^2)	γ_1 (eV)	γ_2 (eV)	F_1 (eV)	F_2 (eV)	R^2
10T[a]	2.348	3.448	0.151	0.255	3.076	0.932	25.364	0.9994
20T	2.323	3.304	0.245	0.245	2.923	0.975	38.457	0.9994
40T	2.295	3.096	0.242	0.239	2.871	0.743	81.853	0.9997
60T	2.277	2.857	0.202	0.240	2.890	0.241	146.06	0.9998
100T	2.205	2.924	0.077	0.212	4.240	0.000	519.21	0.9935
10L	2.019	2.869	0.963	0.103	2.287	3.981	23.302	0.9998
20L	1.926	2.622	1.186	0.041	1.552	2.756	22.144	0.9996
40L	1.765	2.894	0.691	0.087	2.528	3.170	70.141	0.9996
60L	1.722	2.776	0.521	0.092	2.751	0.476	143.98	0.9997
100L	1.679	2.611	0.296	0.125	2.518	0.000	333.16	0.9961

[a]The numbers in the leftmost column indicate the shell thicknesses in the unit of nanometers. T and L represent the cases for the transverse and longitudinal excitations, respectively.