Supplementary Information:

A nanoassembled plasmonic-photonic hybrid cavity for tailored light-matter coupling

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Optical properties of gold nanorods

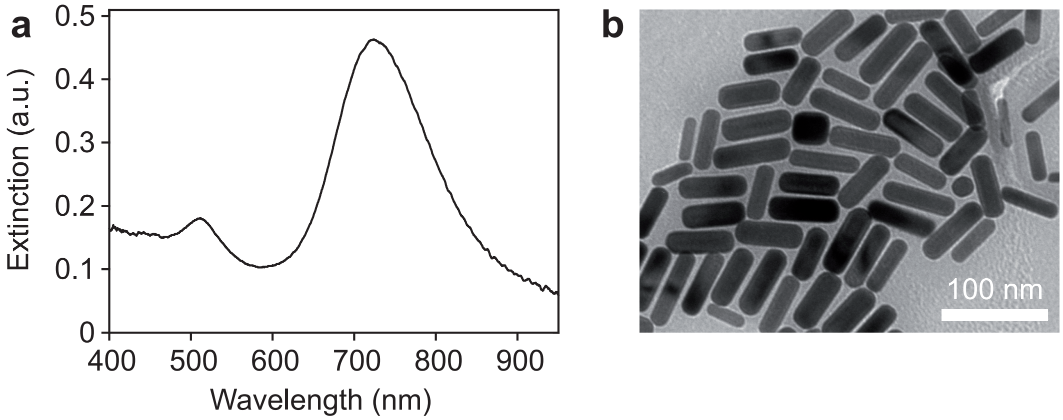

Figure S1: (a) Extinction spectrum of the synthesized gold nanorods in aqueous solution showing a maximum at a resonance wavelength of 727 nm. (b) Typical transmission electron microscope image of these gold nanorods, revealing a mean diameter of (17 ± 2) nm and a mean length of (56 ± 11) nm.

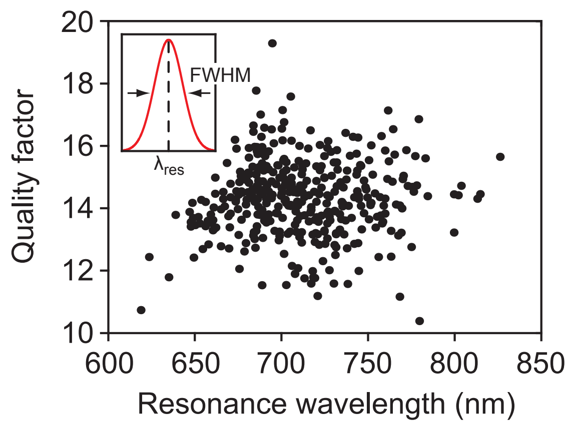

Figure S2: The plasmonic quality factor $Q_{\mathrm{pl}} = \lambda_{\mathrm{res}}/\mathrm{FWHM}$ of the employed gold nanorods, as determined by single particle dark field spectroscopy. The Q_{pl} values derived from 372 measured particle spectra (schematically shown in the inset) are in between ≈ 11 and ≈ 18 with a mean value of ≈ 14.

Optical properties of various gold-cavity configurations

	Q_{exp}(M1)	Q_{theo}(M1)	Q_{exp}(M2)	Q_{theo}(M2)
	3060 ± 50	9110	1860 ± 30	3150
	890 ± 80	4350	1840 ± 30	3130
	3010 ± 50	8880	870 ± 80	2730

Chart S1: Experimentally (Q_{exp}) and theoretically (Q_{theo}) obtained quality factors for modes M1 and M2, respectively. The configurations (from top to bottom line) are: bare cavity without gold nanorod, nanorod oriented perpendicular to the waveguide axis, and nanorod oriented parallel to the waveguide axis. The experimental quality factors are determined from the corresponding fluorescence spectra, while the theoretical values are obtained from FDTD simulations. The diameter and length of the nanorod is assumed to be 18 nm and 46 nm, respectively, in all simulations.

	Q_{exp}(M1)	Q_{theo}(M1)	$V_{\text{eff}}(\text{M1},\vec{r}_0)$	$F_{\text{exp}}(\text{M1},\vec{r}_0)$	$F_{\text{theo}}(\text{M1},\vec{r}_0)$
	2490 ± 40	4300	$(1.16\ \mu\text{m})^3$	~ 30	55
	1910 ± 40	3530			
	720 ± 70	2610	$(0.37\ \mu\text{m})^3$	~ 300	1070
	1420 ± 30	3090	$(2.12\ \mu\text{m})^3$	~ 3	6.6

Chart S2: Experimentally and theoretically obtained quality factors $Q_{\text{exp|theo}}$, effective mode volumes V_{eff}, and Purcell factors $F_{\text{exp|theo}}$ for mode M1. The configurations (from top to bottom line) are: bare cavity without gold nanosphere, one nanosphere on top of cavity center, nanosphere dimer oriented perpendicular to the waveguide axis, and nanosphere dimer oriented parallel to the waveguide axis. V_{eff} is determined from FDTD simulations and evaluated at the fixed reference point $\vec{r}_0$, located at the center between the two nanospheres. $F_{\text{exp|theo}} = (3/4\pi^2)(Q_{\text{exp|theo}}/V_{\text{eff}})(\lambda/n)^3$ is calculated using either Q_{exp} or Q_{theo}, respectively, with $n = 1.0$ being the refractive index at the point $\vec{r}_0$. The width of the gap between the 60 nm spheres is assumed to be 20 nm in the corresponding simulations.