Electronic Supporting Information

Engineering of parallel plasmonic-photonic interactions for on-chip refractive index sensors

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Fig. S1 shows the transmission spectra of the core/shell NCAs with a height of 50 nm as a function of a_{\parallel} . Similar to the transmission spectra of Au NDAs of the similar geometric parameters (Fig. 1d), the D₁ mode couples with both $\lambda_{(\pm 1,0)}^{\text{sub}}$ and $\lambda_{(\pm 1,0)}^{\text{sup}}$ to generate the LPRs. The dipolar bonding interaction between the concentrated charges at the outer and inner Au nanoshells causes the redshift of the resonance wavelength. A weak D₂ mode is also observed at the shorter wavelength, as indicated in Fig. S1. However, the coupling between the D₂ mode and $\lambda_{(\pm 1,0)}^{\text{sup}}$ is very weak.



Fig. S1 The simulated transmission spectra of the core/shell NCAs as a function of a_{\parallel} , which ranges from 400 to 1,200 nm. The NCAs have the lattice constants of a_{\perp} =400 nm and h=50 nm. The parallel diffraction orders $\lambda_{(\pm 1,0)}^{\text{sub}}$ and $\lambda_{(\pm 1,0)}^{\text{sup}}$ are indicated with the white dot lines.

Fig. S2 shows the transmission spectra for the modified core/shell NCAs as a function of a_{\parallel} at different heights. The cutoff of the bottom part of the Au nanoshell weakens the coupling between $\lambda_{(\pm 1,0)}^{\text{sub}}$ and the D₁ mode, but strengthens the coupling between $\lambda_{(\pm 1,0)}^{\text{sup}}$ and the D₁ mode as the effect of substrate is suppressed. Similar to the transmission spectra of the NCAs shown in Fig. 3, the D₂ mode appears and redshifts when the height increases. The co-coupling of the D₂ and D₁ modes with $\lambda_{(\pm 1,0)}^{\text{sup}}$ is observed in Fig. S2c, which is consistent with the results shown in Fig. 5.



Fig. S2 The simulated transmission spectra of the modified core/shell NCAs as a function of a_{\parallel} , which ranges from 400 to 1,200 nm. The NCAs have the lattice constants of a_{\perp} =400 nm, Δh =100 nm and (a) h=150 nm, (b) h=200, and (c) h=300 nm. The parallel diffraction orders $\lambda_{(\pm 1,0)}^{\text{sub}}$ and $\lambda_{(\pm 1,0)}^{\text{sub}}$ are indicated with the white dot lines.