Supporting Information

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SI Text

Near-Field Distribution for Different Incident Polarization. When the laser is polarized along the nanowire (NW), only H_0 and H_2 modes are excited, and plasmon beating along the NW shows the quasiperiodic pattern (Fig. S2*Ai*). As the polarization is rotated away from the parallel direction, besides H_0 and H_2 modes, H_1 mode is excited, which shifts the near-field intensity pattern as can be seen from Fig. S2 *Aii* and *Aiv*. If the laser is polarized perpendicular to the NW, H_1 mode is mainly excited and the near-field intensity is aligned at the sides of the NW (Fig. S2*Aiii*). For the NW in Fig. S2*B*, as the laser polarization is close to the perpendicular direction, the near-field pattern becomes more complex. When the laser is polarized perpendicular to the NW, the near-field intensity is distributed on the two sides of the NW (Fig. S2*Biv*). The higher-order modes can also be excited because this wire is thicker. The shorter-period near-field modulation pattern in Fig. S2*Biv* could be caused by the interference of H_1 mode and the higher-order mode.

Propagation Constants for NWs of Different Radius. With the increase of the coating thickness, the $\mathrm{Re}(\Delta k_{//})$ decreases and approaches a minimum as shown in Fig. S5*A*. However, because the refractive index of the coating layer, i.e., Al_2O_3, is larger than that of the substrate, further increasing the coating thickness ($T > 94$ nm) introduces new asymmetry in the dielectric environment. Re $(\Delta k_{//})$ increases a bit and eventually saturates to a value corresponding to the case of a NW at the glass–Al_2O_3 interface. If the refractive index of the coating layer is the same as the substrate, the $\mathrm{Re}(\Delta k_{//})$ decreases monotonically with the increase of the coating thickness and becomes saturated for very thick coating (Fig. S5*B*).

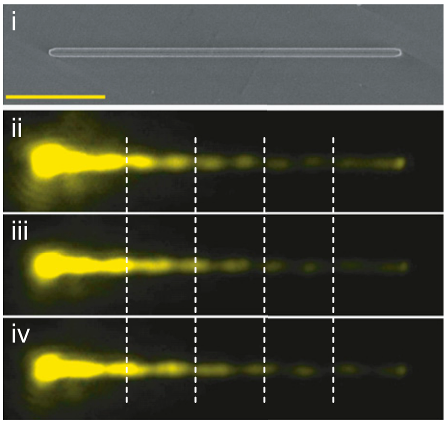

Fig. S1. Near-field distribution changes when additional Al_2O_3 is deposited on top of the quantum dots. (*i*) The SEM image for a NW of 167-nm radius with Al_2O_3 coating of 30-nm thickness. (Scale bar, 5 μm.) (*ii*–*iv*) The near-field distribution measured in air (*ii*), and then after depositing 5 nm of Al_2O_3 (*iii*), and finally with an additional 5 nm of Al_2O_3 (*iv*). The white dashed lines are visual guides to show the shift of the plasmon near-field pattern.

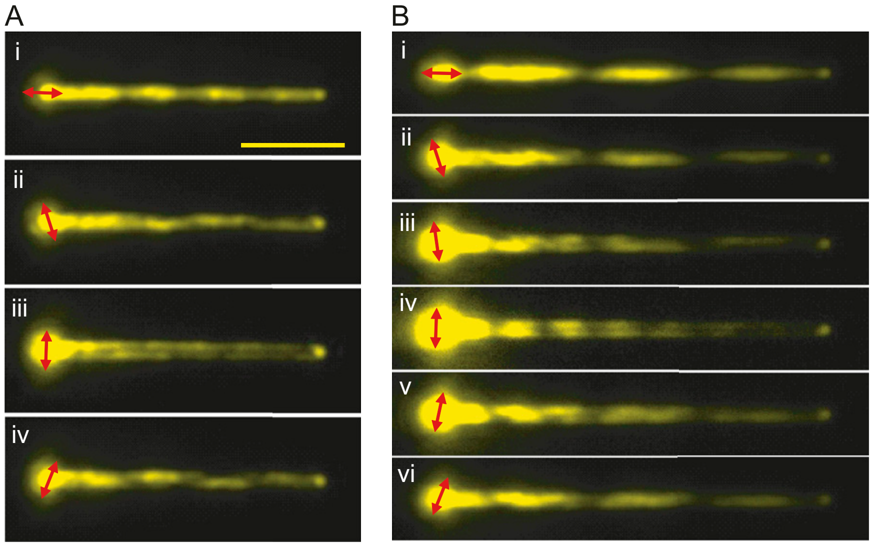

Fig. S2. The near-field distribution for different incident polarization for NWs coated by Al_2O_3 layer of thickness $T = 50$ nm (*A*) and $T = 80$ nm (*B*). The radiuses of the NWs in *A* and *B* are 150 and 180 nm, respectively. (Scale bar in *A* for *A* and *B*, 5 μm.)

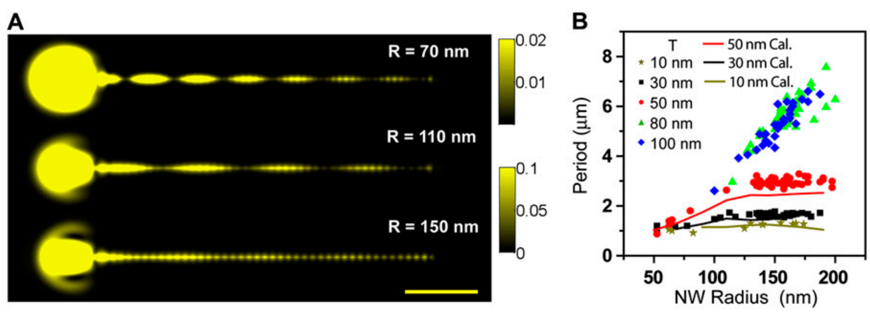

Fig. S3. (*A*) Three-dimensional finite difference time domain (FDTD) calculated electric field intensity distribution in the *xy* plane for NWs of difference radius. The coating thickness *T* is 50 nm. (Scale bar, 2 μm.) (*B*) Comparison of FDTD calculated (lines) beat period and measured data (dots) for thin coatings. The measured data are the same as in Fig. 3*A*. The calculated beat periods are obtained from the near-field distribution. The incident excitation is the same as in Fig. 2.

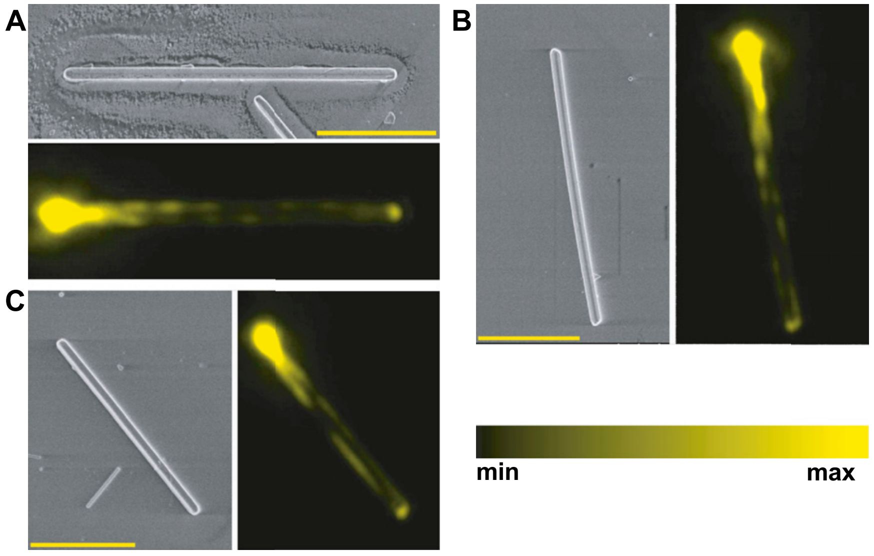

Fig. S4. SEM (*Upper*/*Left*) and near-field distribution (*Lower*/*Right*) images for thick NWs. The radiuses of the NWs are 217 nm in *A*, 222 nm in *B*, and 232 nm in *C*. The Al_2O_3 thickness is 30 nm. (Scale bars, 5 μm.)

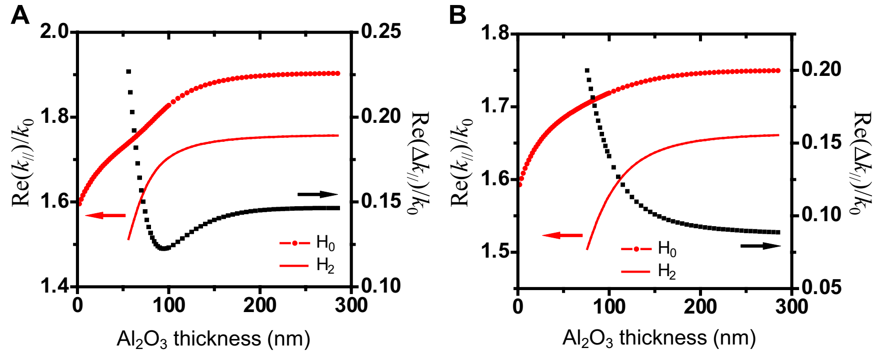

Fig. S5. (*A*) Extended plot of Fig. 3*D*, showing the real part of the propagation constant of the H_0 and H_2 mode for larger Al_2O_3 coating thickness. The difference of the propagation constants is also included. (*B*) The same as *A* except the refractive index of the coating layer is set to 1.5, equal to that of the substrate.

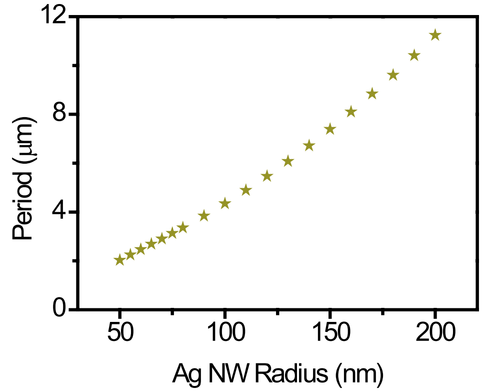

Fig. S6. FDTD calculated beat period for NWs in a uniform medium of air as a function of Ag NW radius. The NWs are coated by Al_2O_3 layer of 10-nm thickness. Cylindrical cross-sections are used in these calculations.

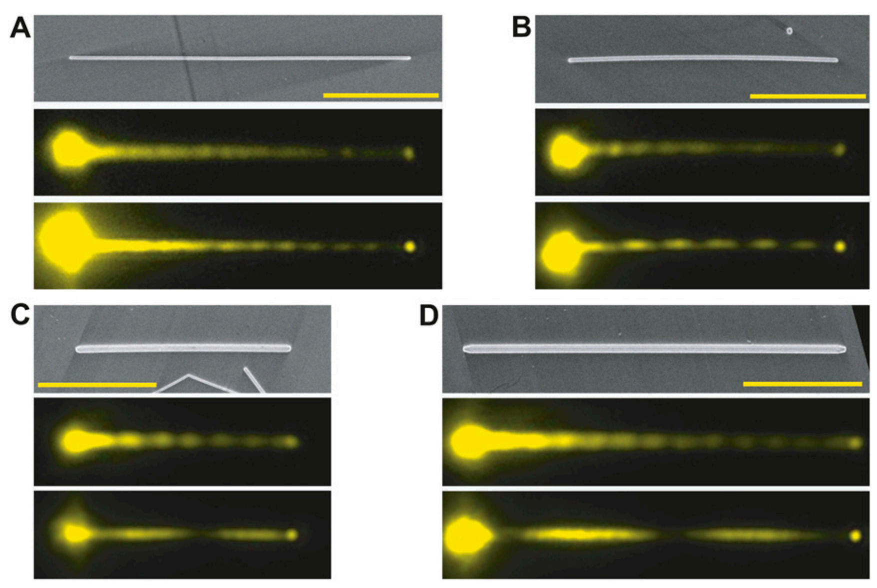

Fig. S7. Near-field distribution for NWs of different radius. The Al_2O_3 coating thickness is 10 nm. The quantum dot emission images are measured in air (*Middle*) and oil (*Bottom*). The radiuses of the NWs in *A*–*D* are 51, 72, 134, and 162 nm, respectively. (Scale bars, 5 μm.) The top panels are SEM images of the NWs. By comparing the bottom panels from *A* to *D*, it can be seen that the beat period increases monotonically with NW radius when the NWs are in a homogenous environment.