Supplementary Data

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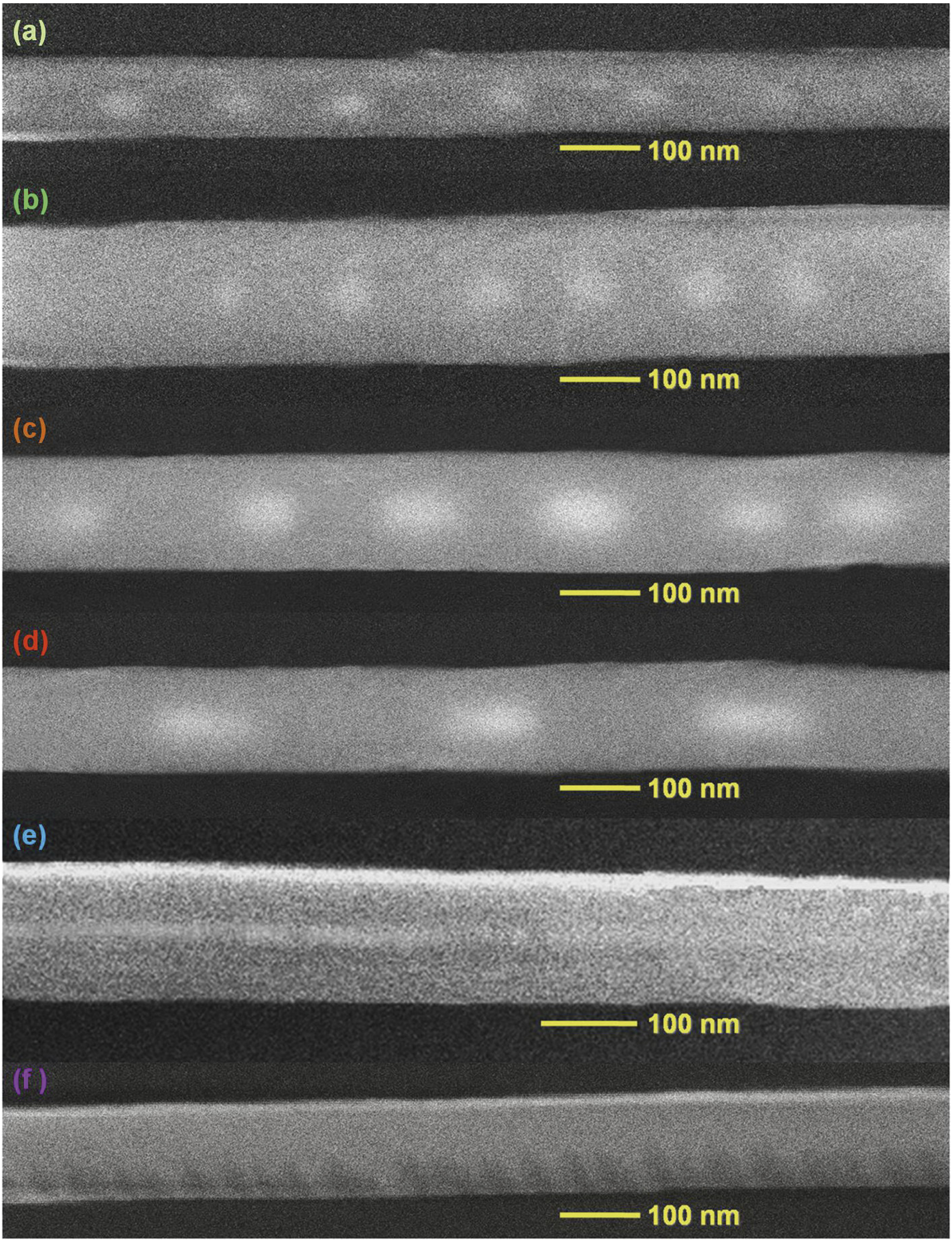
A. SEM images of gold-in-Ga_2O_3 nanowires corresponding to the nanowires studied in the scattering spectra of figure 2.


(a)
100 nm
(b)
100 nm
(c)
100 nm
(d)
100 nm
(e)
100 nm
(f)
100 nm

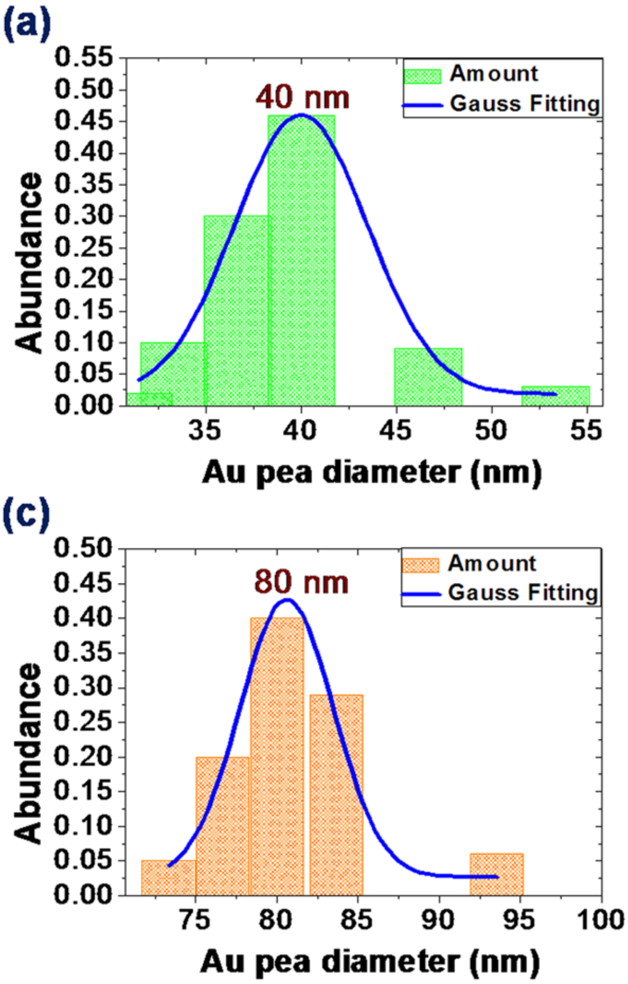


Figure S1. SEM images of actual nanowires studied in the scattering spectra of figure 2 along with particle number distributions with the diameter of Au peas and the aspect ratio of elongated Au peas. The center sizes and average aspect ratio of Au peas are obtained using Gaussian fitting. A gold-in-Ga_2O_3 peapod nanowire with gold pea diameters of (a) 40 nm, (b) 50 nm and (c) 80 nm, (d) a gold-in-Ga_2O_3 ellipsoidal peapod nanowire; the aspect ratio of gold nanorods is approximated as 3.8; (e) a gold-in-Ga_2O_3 core/shell nanowire with core diameter of 20 nm, and (f) a pure Ga_2O_3 nanowire.

B. Effect of illumination.

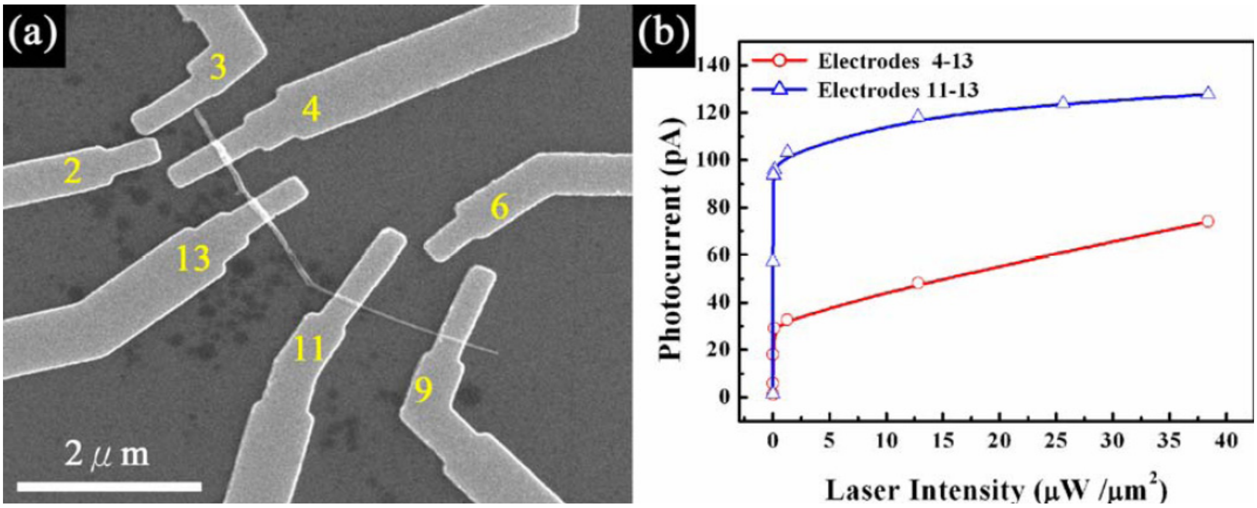


Figure S2. (a) High-magnification SEM image and (b) photo-response behaviors of a gold-in-Ga_2O_3 peapoded nanowire with average gold diameter of 40 nm.

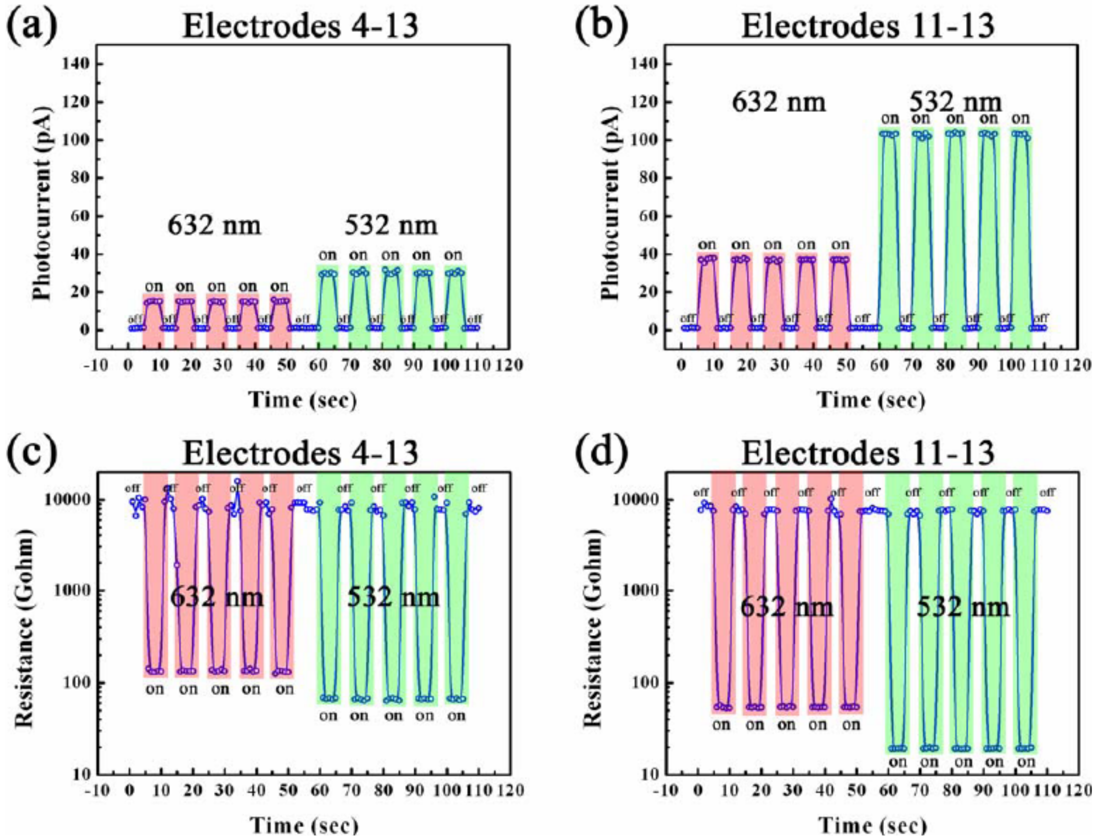


Figure S3. (a) and (b) Photo-response behaviors of illumination-on and -off cycles between No. 4-13 and No. 11-13 electrodes, respectively. (c) and (d) show the corresponding re-plotted figures of resistance vs. time.

C. Surface plasmon resonator.

The mechanism of the plasmonic cavity resonator is as follows: when the gold-in-Ga_2O_3 peapoded nanowire is excited in the parallel-polarized direction along its main axis, surface plasmon polaritons of one Au particle propagate along the Au-Ga_2O_3 interface and radiate an electromagnetic wave at the end of the particle, which is transmitted through the nanowire internally until it is reflected from the neighbor particle, and then is reflected back by the original particle. Consequently, multiple reflections bounce back and forth between the Au particles and standing waves develop, resulting in interference fringes in the scattering spectrum. However, when Au particles are excited in the perpendicular-polarized direction, radiated electromagnetic waves undergo destructive interference and standing waves between particles do not develop; hence the periodic spatial modulation of the scattering spectra is not prominent.

In the experimental characterization of this mechanism, the scattering spectrum taken from the ends of a gold-in-Ga_2O_3 peapod nanowire under parallel excitation exhibits minor peaks with a periodic spacing characteristic. The minima in the spectrum from one end of the nanowire correspond to the maxima in the spectrum from the other end, indicating that constructive interference of plasmons is occurring within the nanowire.

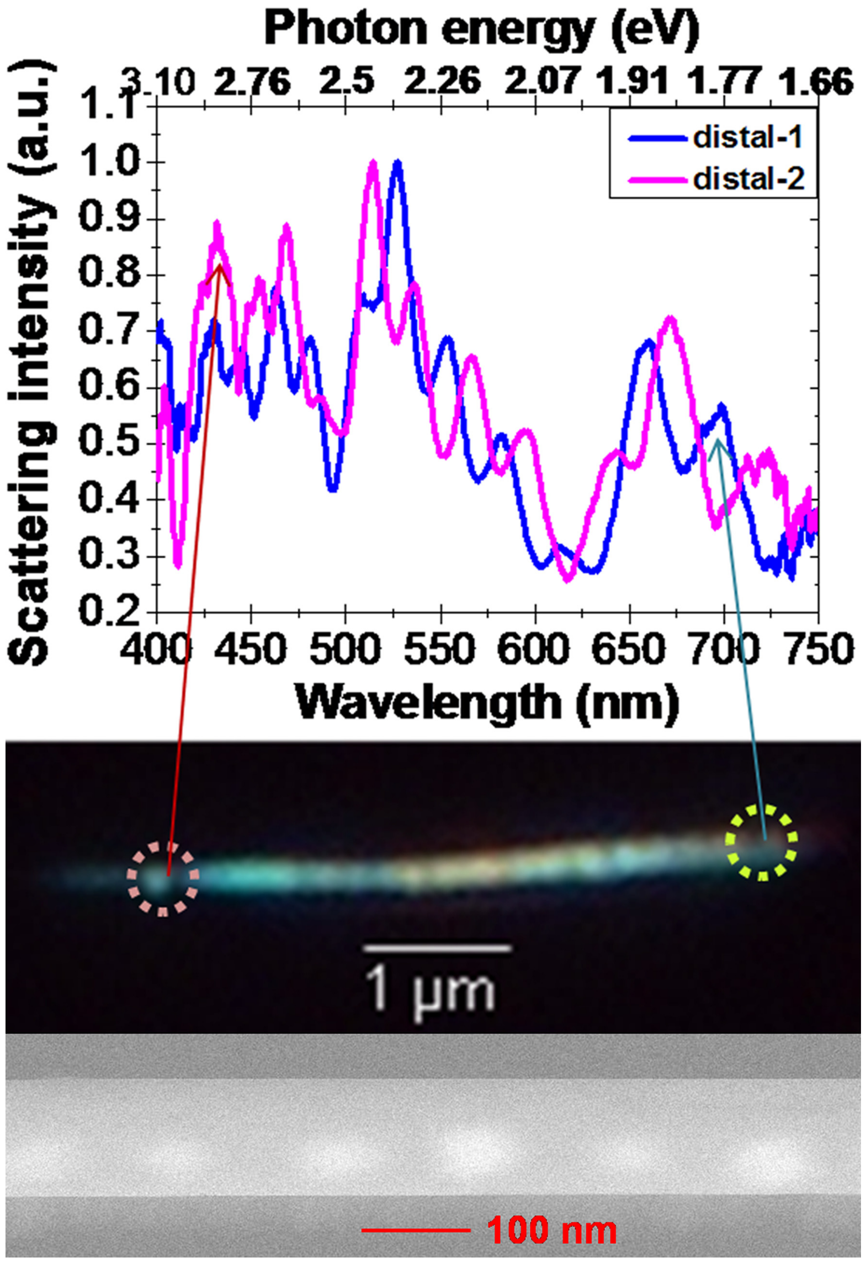


Figure S4. Scattering spectra from the two tips of the gold-in-Ga_2O_3 peapod nanowire shown in the OM image and the SEM image. The wavelength-dependent periodic modulation of light and the correspondence between the one end minima to the other end maxima indicate the nanowire acted as a surface plasmon resonator.