Supporting Information for **"Modulating Resonance Modes and *Q* Value of a CdS Nanowire Cavity by Single Ag Nanoparticles"** *by Qing Zhang, Xin-Yan Shan, Xiao Feng, Chun-Xiao Wang, Qu-Quan Wang, Jin-Feng Jia*, and *Qi-Kun Xue*

1. Setup of micromanipulator

Figure S1(a) shows the setup of our micromanipulator, which contains a piezoelectric driven stage (Thorlabs Nanomax 311), and the red rectangular part is enlarged in Figure S1(b). The nanoprobe is a glass fiber made from a capillary tube with original inner and outer diameter of 0.5 mm and 0.8 mm, respectively. While the middle section of the capillary tube is heated by the resister, one end of capillary is fixed and the other end is pulled by a weight. After several seconds, the heat melts the middle part of the capillary and a fine tip glass fiber is made. Figure S1(c) is an optical image of a typical glass fiber (Objective: 100×, NA: 0.9). The apex diameter of the glass fiber is estimated to be 400~500 nm. The glass fiber was then mounted onto our micromanipulator to transfer the nanowires (NWs) and nanoparticles (NPs). By monitoring from a CCD equipped on the microscope, we can transfer Ag NP and move it around CdS NW precisely.

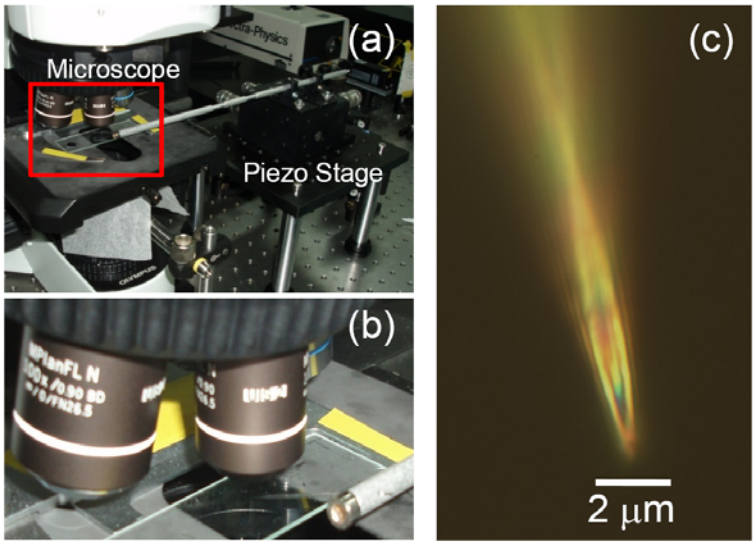

Figure S1. (a) Setup of micromanipulator. (b) The magnification image of red circled area in (a). (c) Optical image of a glass fiber probe.

2. Atomic Force Microscopy (AFM) Images of a CdS NW and an Ag NP

Figure S2 shows AFM images of the CdS NW and the Ag NP depicted in Figure 2(b). The length of the CdS NW is 12 μm. The diameters of the CdS NW and the Ag NP are 170 nm and 100 nm, respectively. The gap separation δ between CdS NW and Ag NP is approximately 300 nm.

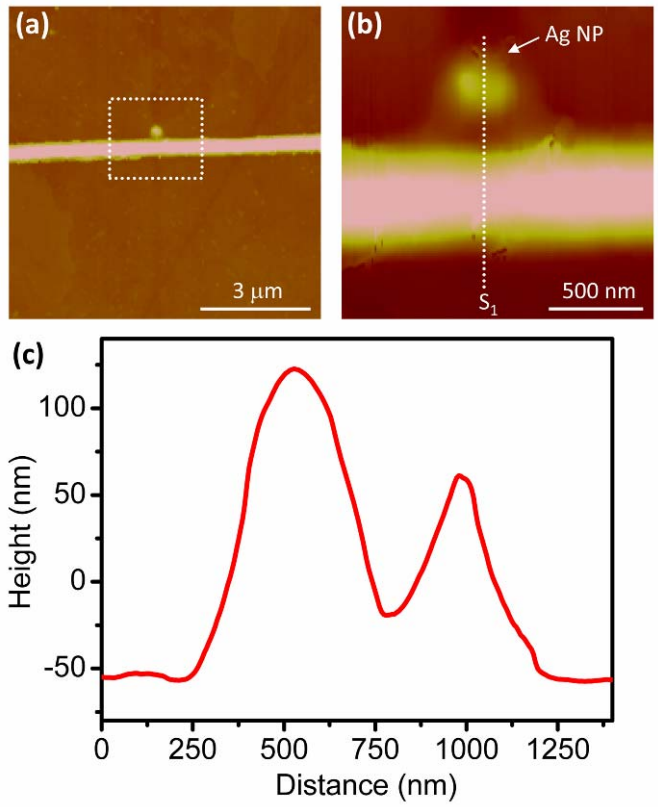

Figure S2. AFM images of a CdS NW and an Ag NP. (a) AFM image of the CdS NW and the Ag NP depicted in Figure 2(b). (b) Corresponding magnified AFM image of the area circled by white dashed line in (a). (c) Height distribution of cross section line S_1 in (b).

3. PL spectra dependent on gap separation between CdS NW and Ag NP.

Figure S3 shows PL spectra (background subtracted) of the CdS NW depicted in Figure 2(b) when the gap separation between it and the Ag NP is 50 nm (blue line), 150 nm (red line), and 300 nm (dark line). The PL spectra were recorded when a 488 nm focused laser excited at left end of the CdS NW depicted in Figure 2(b). The resonances wavelengths exhibit no changes but the relative intensity of two adjacent resonances modes is tuned more significantly and the new oscillation period of $2\Delta\lambda$ becomes more obvious as gap separation decreases.

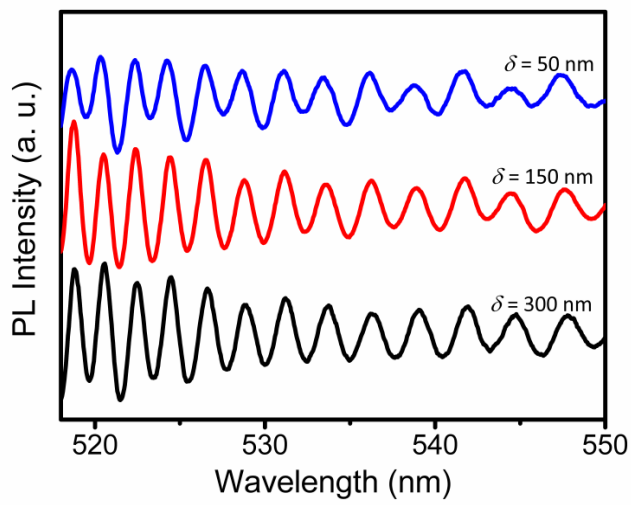

Figure S3. PL spectra dependent on gap separation between CdS NW and Ag NP. The PL spectra of the CdS NW depicted in Figure 2(b) when gap separation between it and the Ag NP is 50 nm (blue line), 150 nm (red line) and 300 nm (black line).

4. PL spectra when the laser excites at both the Ag NP and CdS NW.

We measured the PL spectra when the laser excites both the NP and the NW at the same time. The red curve in Figure S4 at below shows the emission spectrum of Ag NP when the laser excites at the Ag NP. The peak position is almost the same and the intensity is just enhanced 6% compared with the situation of no Ag NP (blue curve). Considering the size of the NP (100 nm) and the distance to NW (50 nm – 300 nm), the diameter of our excitation laser spot (~1 μm) could be too large to measure the local interaction, while the strong PL of CdS would cover the influence of Ag NP.

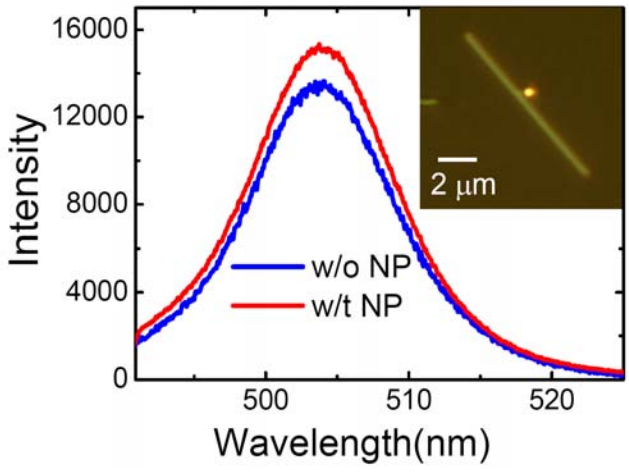

Figure S4. PL spectra when the laser excites at both the Ag NP and CdS NW. The red and blue curves are PL spectra with and without Ag NP, respectively. The inset is the optical image of Ag-CdS Hybrid system. The distance between is about 150 nm.

5. Scattering Spectra of Ag NP

We also measured the scattering spectra of the Ag NP with a diameter of ~ 100 nm. The scattering peak is located at about 529 nm as shown in Figure S5, which is at the red side of the resonance mode (518 nm) of the CdS NWs.

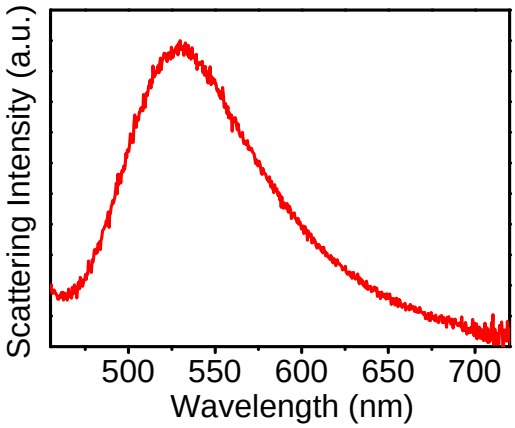

Figure S5. Scattering spectra of the Ag NP with a diameter of ~100 nm.