Supporting information

Strain-induced Large Exciton energy Shifts in Buckled CdS Nanowires

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Experiments and methods

1. PDMS preparation

The PDMS (Sylgard 184, Dow Corning) was prepared by mixing a silicone gel and a cross-linker in a 10:1 ratio by weight. PDMS was degassed in vacuum for approximately 30 min and cured for 2 hour at 80℃.

2. Strain stage used for control buckling of nanowres

To control the strain applied to nanowire, a custom-built strain stage for uniaxial tension/compression was designed. The substrate was firmly clamped in between the two grips to prevent slipping. Applied local strains were calculated based on measured radius of curvature and diameter of nanowire by optical microscope and scanning electron microscope.

3. μ-PL (photoluminescence) and μ-R (Reflactance) measurements

μ-PL and μ-R systems equipped with a low temperature cryostat mounted on a piezoelectric ceramic stage. A continuous wave Argon ion laser (457.9 nm) was focused by a 60X (NA, 0.7) objective (Nikon) to a Gaussian spot of ~800 nm (Full-Width-Half-Maximum, FWHM) for exciting a single buckled nanowire. The PL emitted from the sample was collected by the same objective and directed to an optical fiber mounted on a piezoelectric translator stage (Physik Instrumente) with a spatial resolution of ~200 nm. The light collected by the fiber was coupled to a 0.5 m monochromator (Princeton Instruments), dispersed by a 1200 grooves/mm 500 nm-blaze grating and detected by a cooled CCD (Acton) resulting in a FWHM spectral resolution of 0.025 nm. For μ-R measurement, the same set-up was utilized, but the laser was replaced by a collimated white light source.

4. **Real-color emission imaging measurement**

In this set-up, two filters (Semrock) were used; bandpass filter FF02-482 with transmission band from 471-494 nm was inserted in front of the whitelight source. This filtered light is used for exciting the buckled nanowires. The longpass filter Di01-R488 was mounted in front of the camera (Q-imaging, RETIGA 4000k) for real-color image acquisition. The spectrum from the node region (centered at ~500 nm) is very near the cut-off edge of the longpass filter, while the spectrum from the antinode region shifts significantly to the long wavelength, which changes the the correspondingcolor in the image from blue to green. Since the transmission spectra of both filters have a very small overlap, and considering much stronger intensity of the excitation light, it is possible that the reflected light from the nanowire body may also contribute to the blue colored image acquired from the node region of thebuckled nanowire.

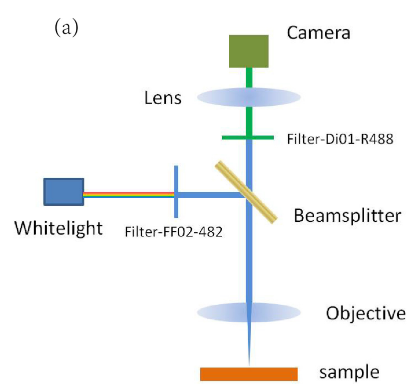

Figure. S-1 Schematic of the of real-color imaging experiment.

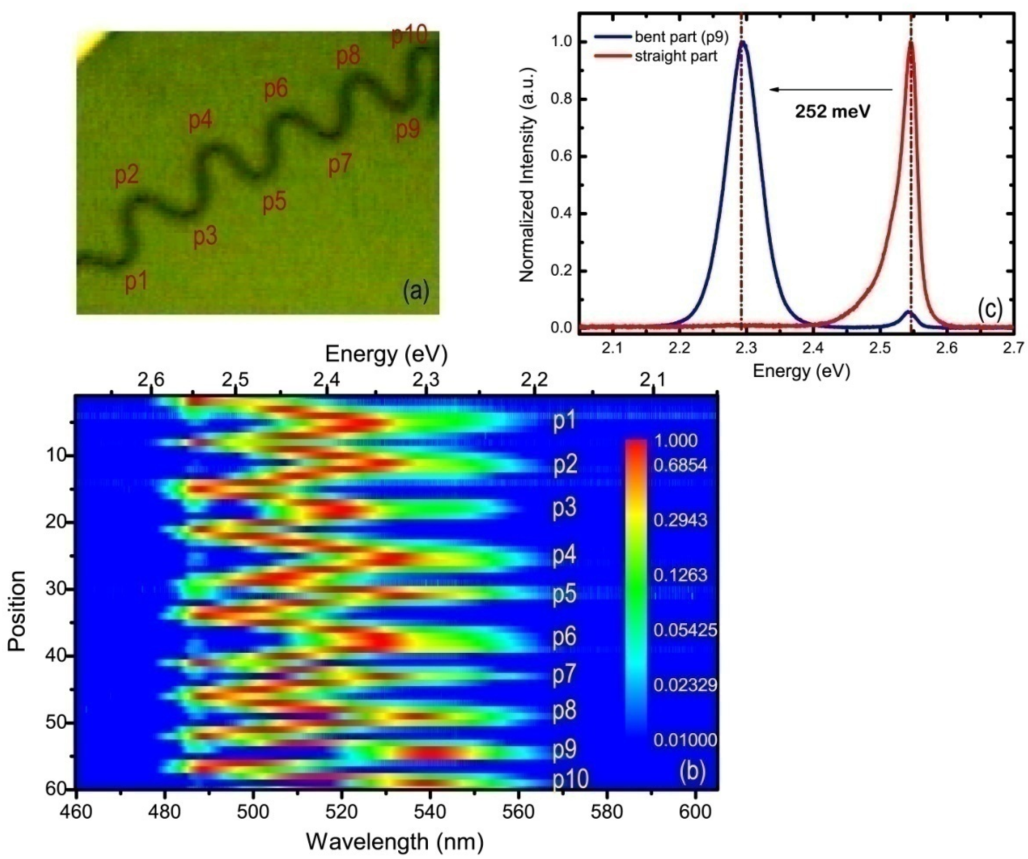

Figure. S-2 (a) Optical image of a single buckled CdS NW, the bent parts are labeled from p1 to p10. (b) Spatially-resolved PL image of the buckled NW, with the labels (p1-p10) corresponding to the antinode regions in (a). (c) PL spectra measured at both straight and bent (p9) regions, which shows a huge redshift of the emission peak (252 meV) between the two regions. The estimated strain at the highest curvature is ~11%,which we believe is close to the fracture limit as any further stress in the system breaks the nanowire.

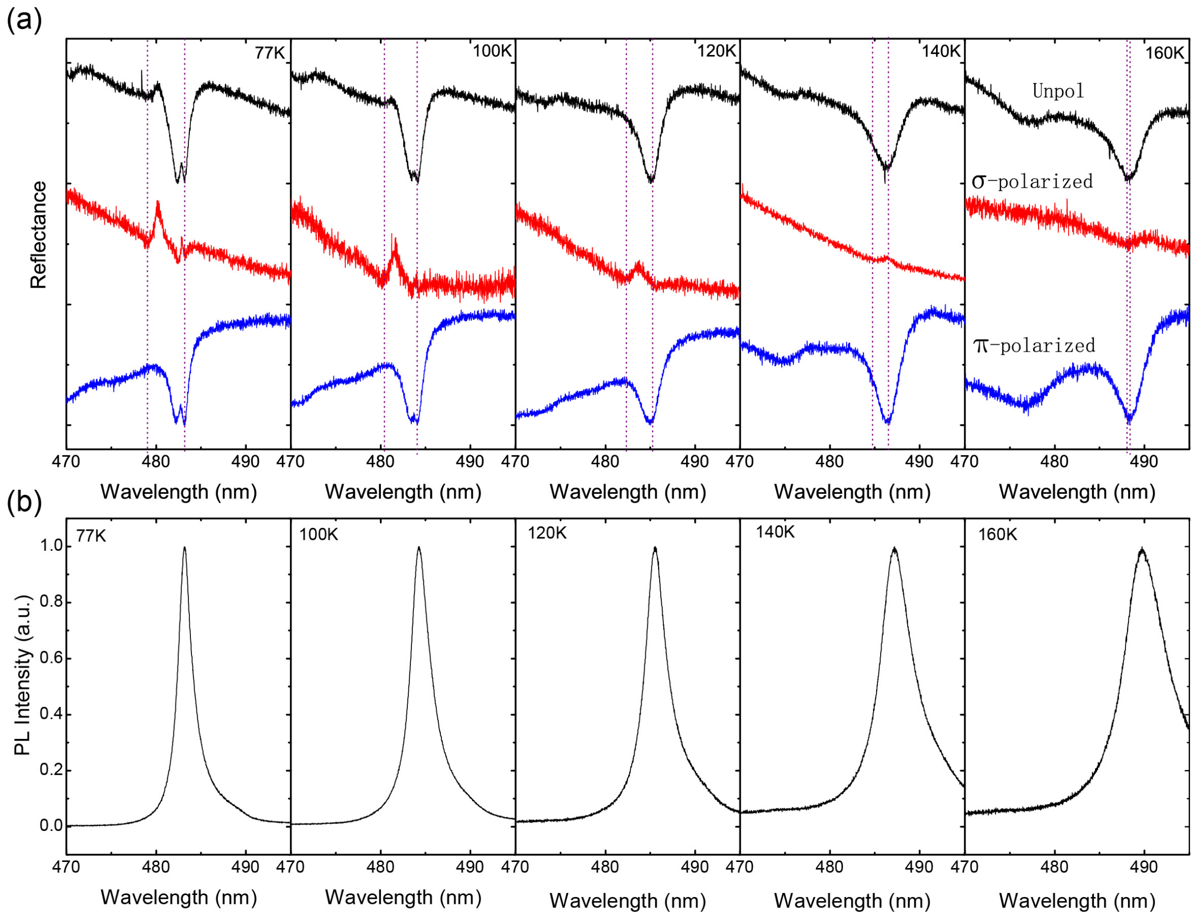

Figure. S-3 (a) Polarized reflectance spectra of a CdS NW on PDMS substrate measured at different temperatures. The energy positions of A and B excitons are indicated by dashed lines. (b) Corresponding PL spectra at different temperatures.