Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Asymmetric Half-Cone/Nanohole Array Films with Structural and Directional Reshaping of Extraordinary Optical Transmission

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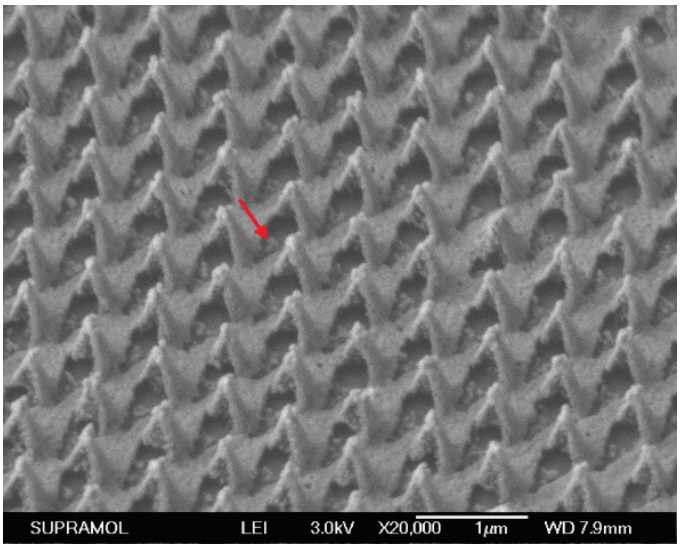

Figure S1. SEM image of the asymmetric half-cone/nanohole array with 600-nm tip height. The image is taken from a 45° tilting view. The red arrow indicates that few small Ag particles are deposited in the shadow, which ought to be empty. The Ag is always in the form of nanoparticles and cannot form a film.

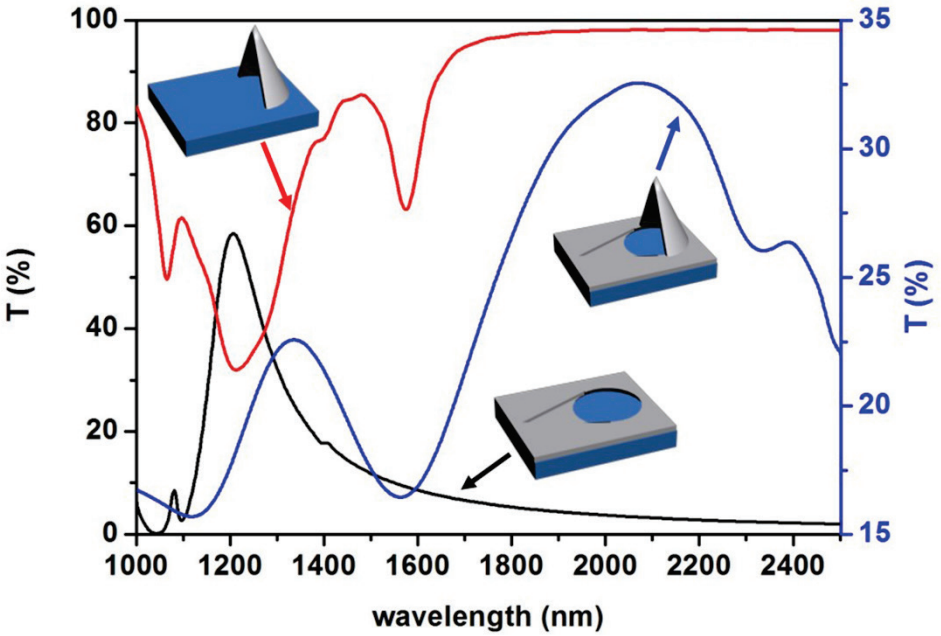

Figure S2. Simulated transmission spectra from the bottom nanohole array (black curve) and top half-cone shell array (red curve) which are artificially separated from the asymmetric half-cone/nanohole array. The blue line is the measured spectrum of the whole asymmetric half-cone/nanohole array. The electric field is directed along the long axis.

The peak of the black line at about 1200 nm is generated due to the periodic effect and assigned as (1, 0) (Bragg resonance orders) transmission peak at the Ag/glass interface. This peak is also clearly visible in the transmission spectra of the asymmetric half-cone/nanohole array in the blue curve. The dip position of the red line at 1600 nm is similar with that of the asymmetric half-cone/nanohole array (blue curve). At longger wavelength, the LSPR on the tip is excited, but the seperated half-cone shell particles cannot block the incident light, resulting in nearly 100% transmission. Therefore, the transmission peak excited by the tip cannot be recognized. When the two parts form the whole asymmetric half-cone/nanohole array film, the bottom film blocks the directly transmitted light and the transmission peak at 2070 nm (blue curve) appears. Overall, the transmission spectra of the asymmetric half-cone/nanohole array (blue curve) well fits to the overlap of the spectra of the bottom nanohole array (black curve) and top half-cone shell array (red curve).

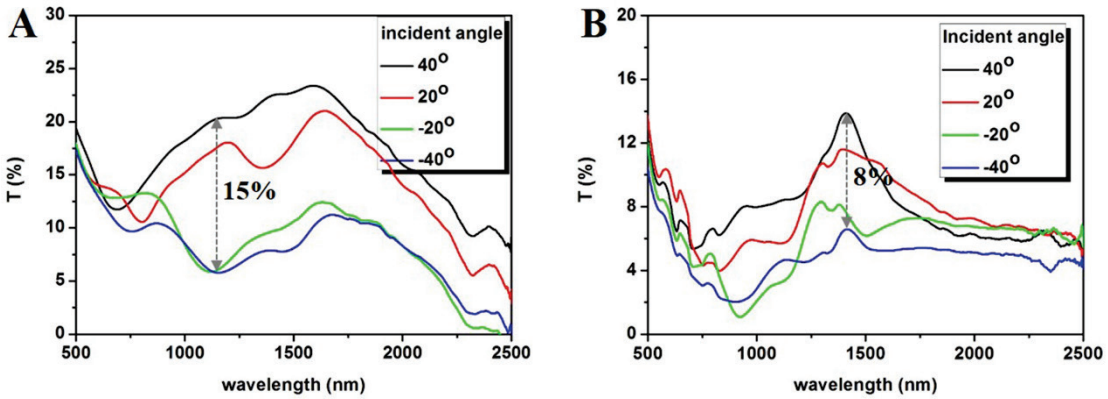

Figure S3. Angle-dependent transmission spectra of the asymmetric half-cone/nanohole arrays with (A) 500-nm and (B) 400-nm tip height for the electric field being along the x (long) axis. The maximum deference value of the transmission intensity is 15% and 8%, respectively.

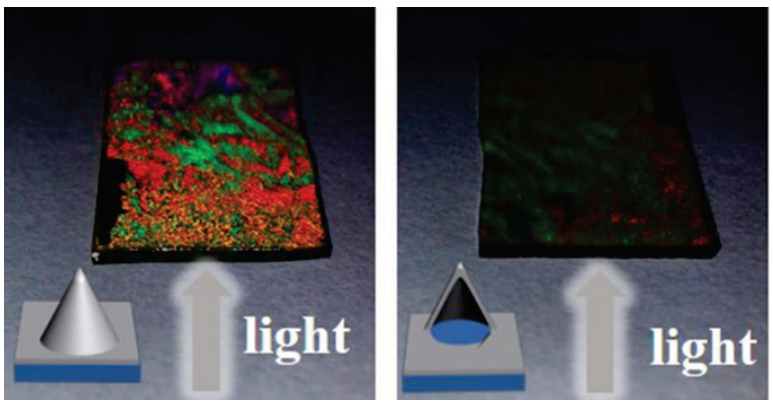

Figure S4. Optical images of the sample illuminated by an inclined white light beam with an angle of 70° from the (A) shelter side and (B) empty side.