Supplemental Information for

**Gap-mode excitation, manipulation, and refractive-index sensing application by gold nanocube arrays**

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Fig. S1. (a) Simulated reflection spectra of the periodical Au NCAs (edge length $L=85$ nm, period $P=241$ nm) atop Au film with a spacer (height $h=8$ nm) under normal incidence or $8^\circ$ off the normal incidence (as the same as the incident angle used in measurement), (b) the corresponding profiles of normalized electric field ($|E/E_0|^2$, the upper row) and magnetic field ($|H/H_0|^2$, the lower row) at the wavelength of reflection dip.
Fig. S2. Measured optical density of Au nanocubes in varying sizes (i.e., edge length $L=65$ nm, 85 nm or 115 nm). The insert on the right column is the corresponding TEM images.

Fig. S3. Measured reflectance spectra of the prepared Au NCAs atop the Au film with a spacer (fill fraction $ff=11.2\%$, edge length $L=65$ nm, spacer height $h=12$ nm) under un-polarized irradiation with various incident angles.