Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supporting Information

Coherent optical coupling of plasmonic dipoles in metallic nanoislands with random sizes and shapes

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S1: Fabrication methodology:

E-beam lithography was used to generate templates with similar patterns in four square regions on glass substrates (Fig.S1a). The dimension of each region was 300×300 μm^2. Fig.S1b schematically shows magnification of the template in one of these regions. After evaporation of Au on such substrates and lift up using chemical means, the samples were annealed, forming of NISs (Fig.S1c). The extinction spectra of NISs in the four regions in each substrate were averaged to represent a better statistics.

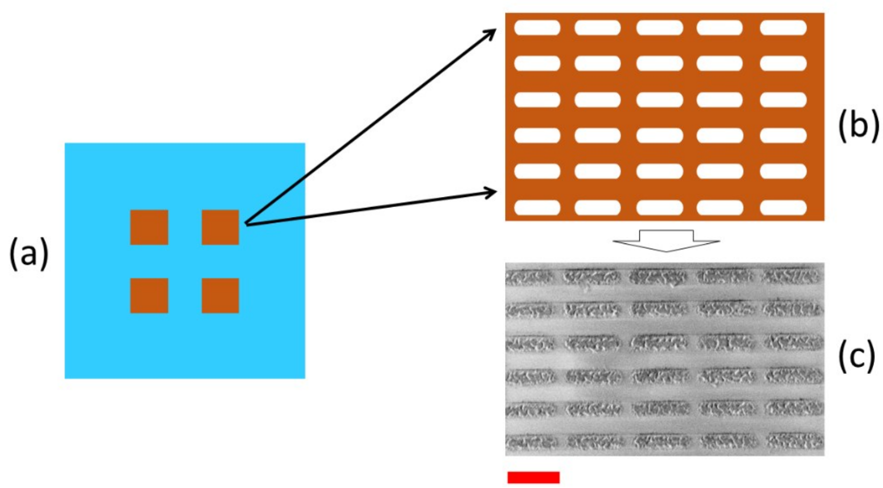

Figure S1. (a) Overview of a glass substrate containing four photonic lattice template. (b) Magnified view of periodically exposed areas in one of the regions. Arrays of NISs were formed after Au deposition with certain thickness followed by annealing (c). The bar in (c) is 800 nm. (c) shows the SEM image of sample 4.

S2: Relative evolution of extinction spectra of samples 1-5

The extinction spectra of samples 1-3 support a clear development of SLR as the sizes of NIS are increased. For x-pol this trend disappears as the NISs are replaced with amorphous interconnected Au in sample 4 (dotted line, Fig.S2a). For y-pol (Fig.S2b), however, we a significant enhancement of parallel coupling from samples 4 to 5 (y-pol).

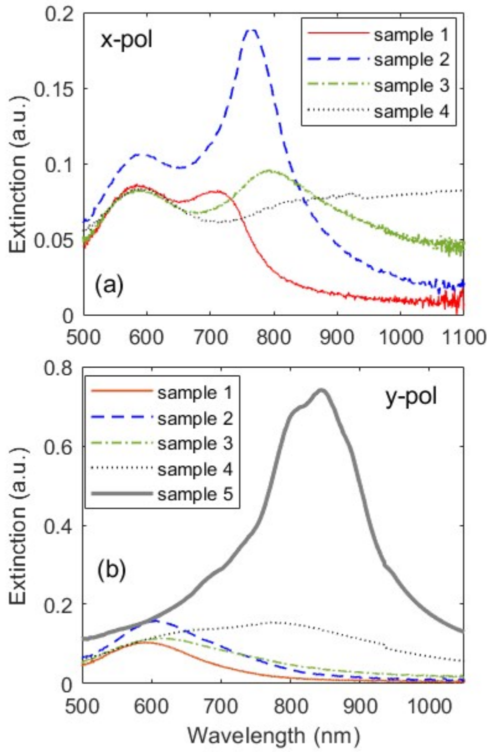

Figure S2. Extinction spectra of samples 1-4 for x-pol (a) and for samples 1-5 for y-pol (b) in the presence methanol.

S3: Removal of RA degeneracy with rotation for the case of sample 4:

The case of sample 4 represents a transition from orthogonal to parallel coupling. Results in Fig.3d showed onset of formation of SLR (P_2). To study removal of degeneracy of such SLR with rotation, we investigated the extinction spectra of this sample under rotation along the x-axis for y-pol when it was covered with 10 nm (Fig.S3a) and 30 nm of Si (Fig.S3b).

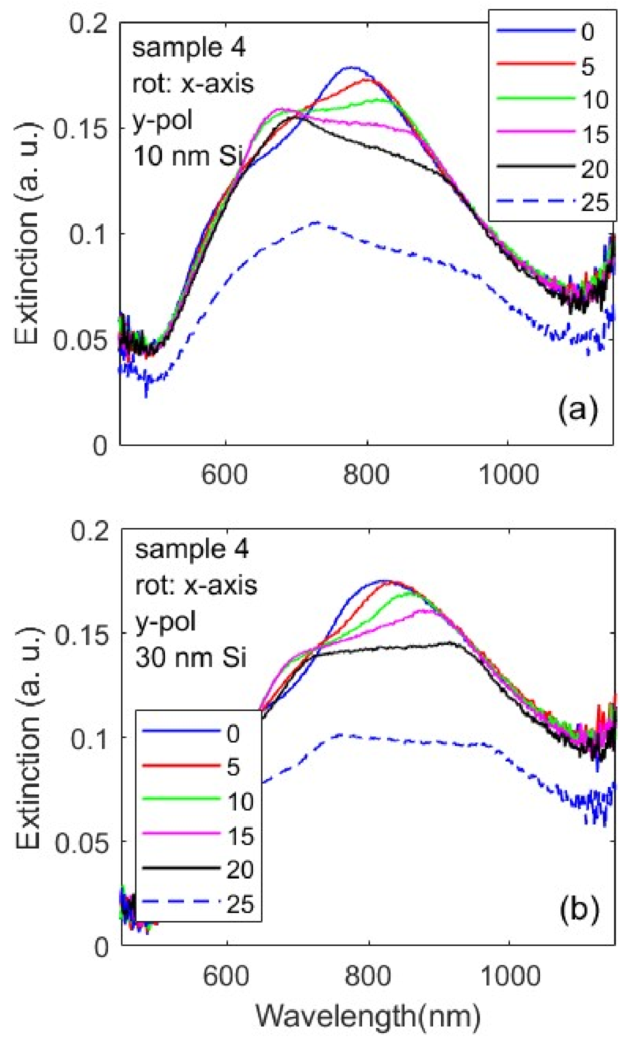

Figure S3. Extinction spectra of sample 4 for y-pol when the sample is rotated along the y-axis. In (a) the sample is covered with 10 nm of Si and in (b) with 30 nm of Si. The legends refer to rotation angles of rotation.

S4: Removal of RA degeneracy with rotation for the case of solid mANT arrays:

For the case of sample 5, even when the superstrate is air, SLR is quite well resolved. A characteristic feature of such a resonance is removal of RA degeneracy as the angle of incident light increases. Fig.S4 shows the results for extinction spectra of sample 5 under different angles of rotation (legends) when superstrate is air.

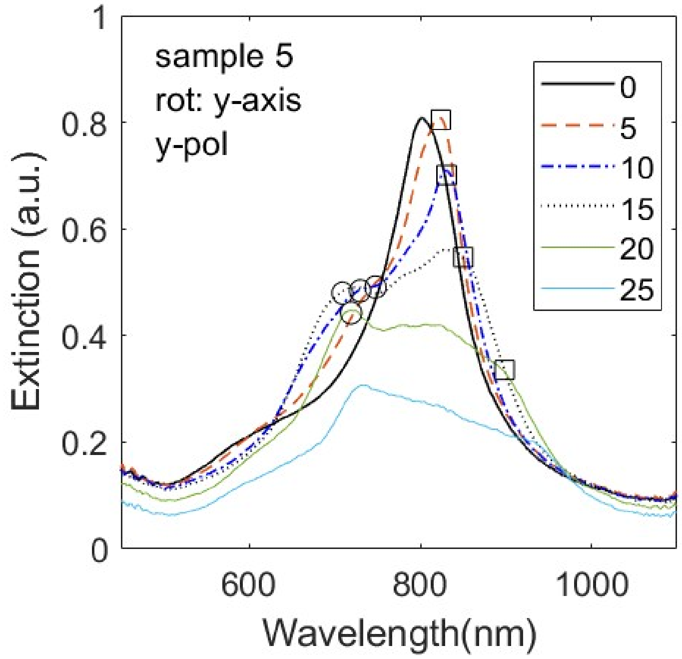

Figure S4. Extinction spectra of sample 5 for y-pol when the sample is rotated along the y-axis. Here the superstrate is air. The legends refer to rotation angles.