Subwavelength Direct Laser Patterning of Conductive Gold Nanostructures by Simultaneous Photo-Polymerization and Photo-Reduction

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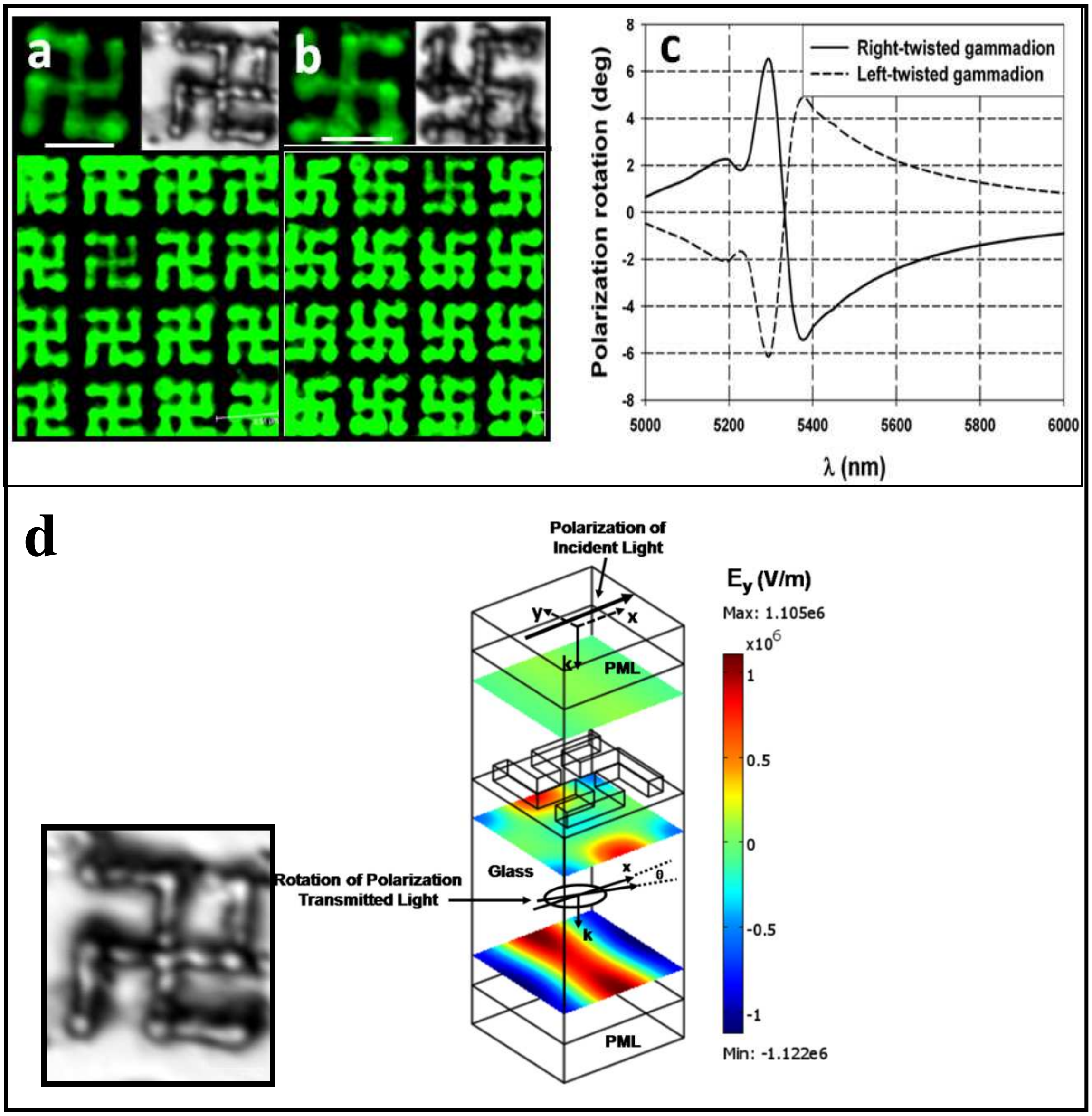
Supporting Information:

S1: *(a,b) Confocal image of the noncentrosymmetric structures: Fluorescence and transmission image of (a) the left handed grating structure and (b) the right handed grating structure; (c) Analysis of chiral gammadion structures: rotation of field polarization vs. λ in the transmitted; scale bar = 2 μm; (d) Computational model for a single element of a 2D array showing the presence of an* E_y *field component in the transmitted field.*

Two mirror symmetric chiral forms have been prepared as shown in Fig. S1 a, b. We used full-wave electromagnetic analysis to predict the response of a fabricated 2D array of the gold-doped gammadion-shaped structures on a glass substrate. Fig. S1 c and d show the results of the computational model. The array used for computation is periodic with a 6μm center-to-center spacing between neighboring elements, each of which measures 4μm on a side and is 600nm in height. The incident field is linearly polarized along the x-axis and the field propagates downward through the element. We impose periodic boundary conditions about this element to account for the presence of its neighbors. We illuminate the element at normal incidence over a range of wavelengths, 5000nm ≤ λ ≤ 6000nm, and we use a constitutive relation for the complex permittivity of gold that is appropriate for these wavelengths. The polarization of the transmitted field is rotated due to the chirality of the elements. We plot the polarization rotation for both left and right-twisted gammadion structures in Fig. 6c. Note that the polarization is rotated in an opposite sense for the two orientations, which is consistent with other published experimental and theoretical studies.


a
b
c
Right-twisted gammadion
Left-twisted gammadion
Polarization rotation (deg)
λ (nm)
d
Polarization of Incident Light
E_y (V/m)
Max: 1.105e6
x10^6
PML
Glass
Rotation of Polarization Transmitted Light
Min: -1.122e6