

Supporting Information for

DNA-guided room-temperature synthesis of single-crystalline gold nanostructures on graphdiyne substrates

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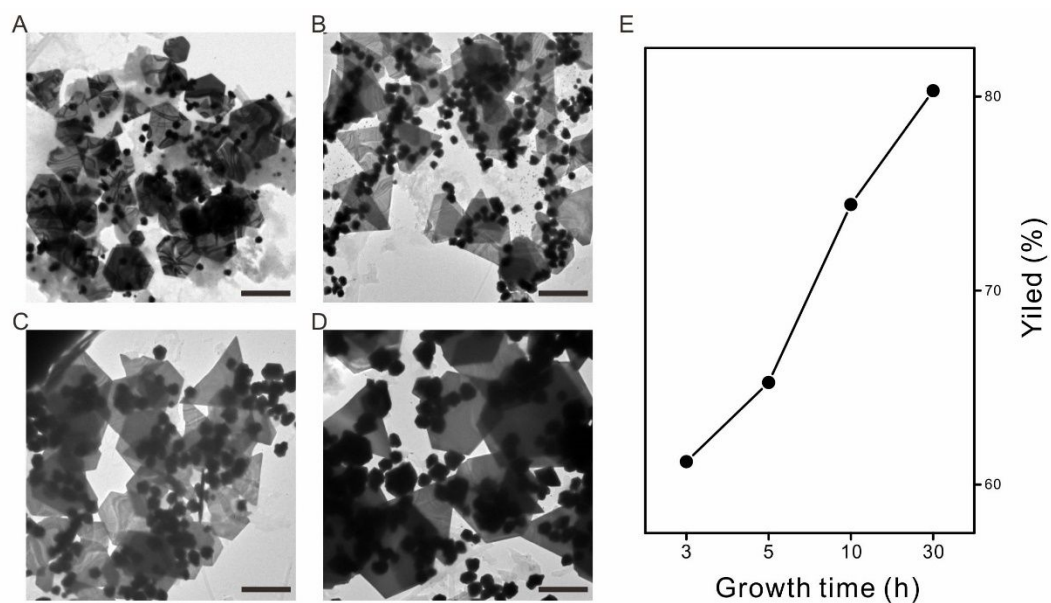


Figure S1. (A-D) Wide-field TEM images of Au nanoplates with 4 mM HAuCl_4 (growth time, 3, 5, 10, and 30 h, respectively). Scale bar: 1 μm . (E) Plot of nanoplate yield vs. growth time. Here, we defined yield as the areal fraction of Au nanoplates as estimated from the TEM images.

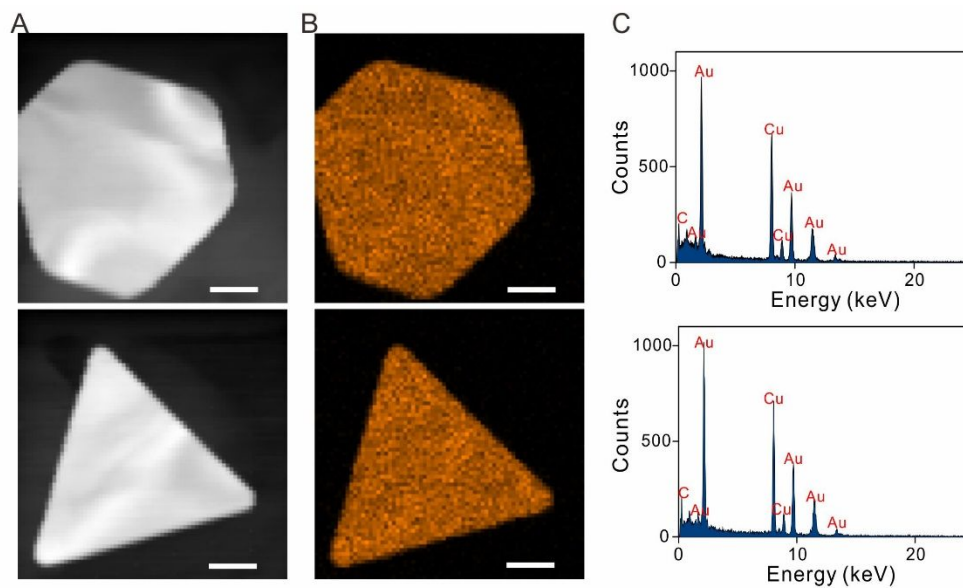


Figure S2. HAADF-STEM characterization of Au nanoplates (growth time, 5 h). (A) HAADF-STEM images of Au nanoplates. (B) Corresponding element mapping. Scale bar: 200 nm. (C) Point EDX data acquired from the Au nanoplates. Peaks corresponding to C, Cu, and Au present in the spectrum. Au signals are from the Au nanoplate, while the Cu signal is from the copper grid

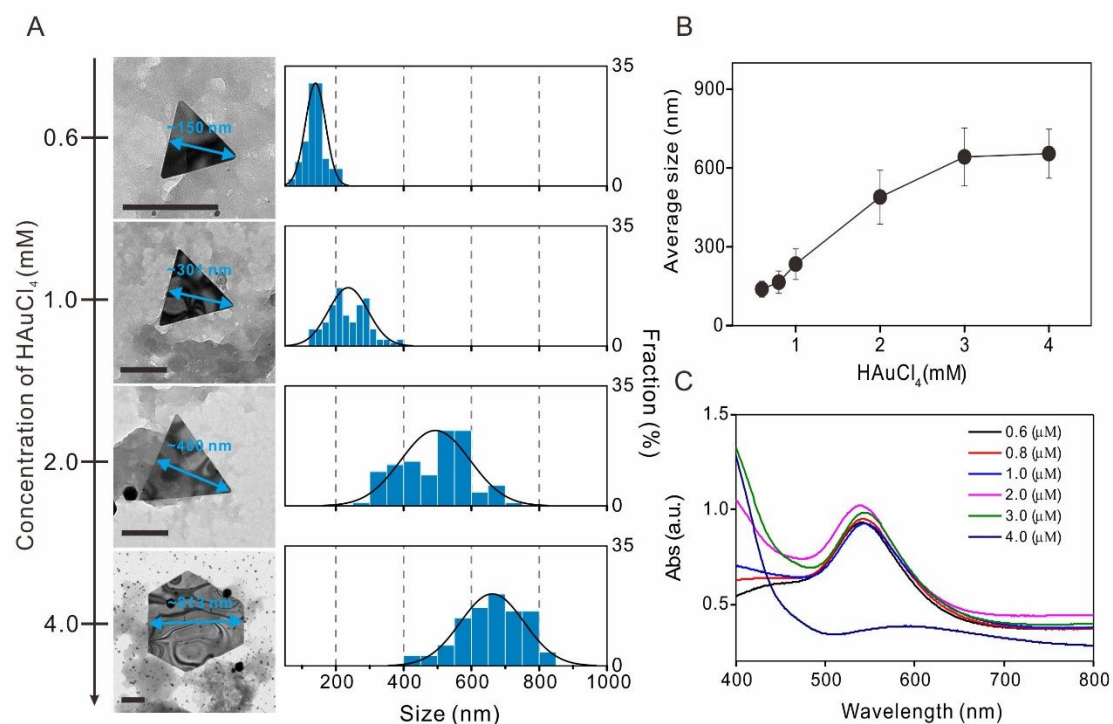


Figure S3. Effect of HAuCl_4 concentration on the size of the Au nanoplates. (growth time, 5 h). (A) Typical TEM images of an Au nanoplate on multilayer GD synthesized and size distributions ($N=100$) obtained in the presence of various concentrations of HAuCl_4 : 0.6 mM, 1.0 mM, 2.0 mM, 3.0 mM, 4.0 mM. Scale bar: 200 nm. (B) Average size of the Au nanoplates plotted as a function of HAuCl_4 concentration. (C) The UV-vis absorbance of products with various concentrations of HAuCl_4 (0.6 mM, 1.0 mM, 2.0 mM, 3.0 mM, and 4.0 mM, respectively).

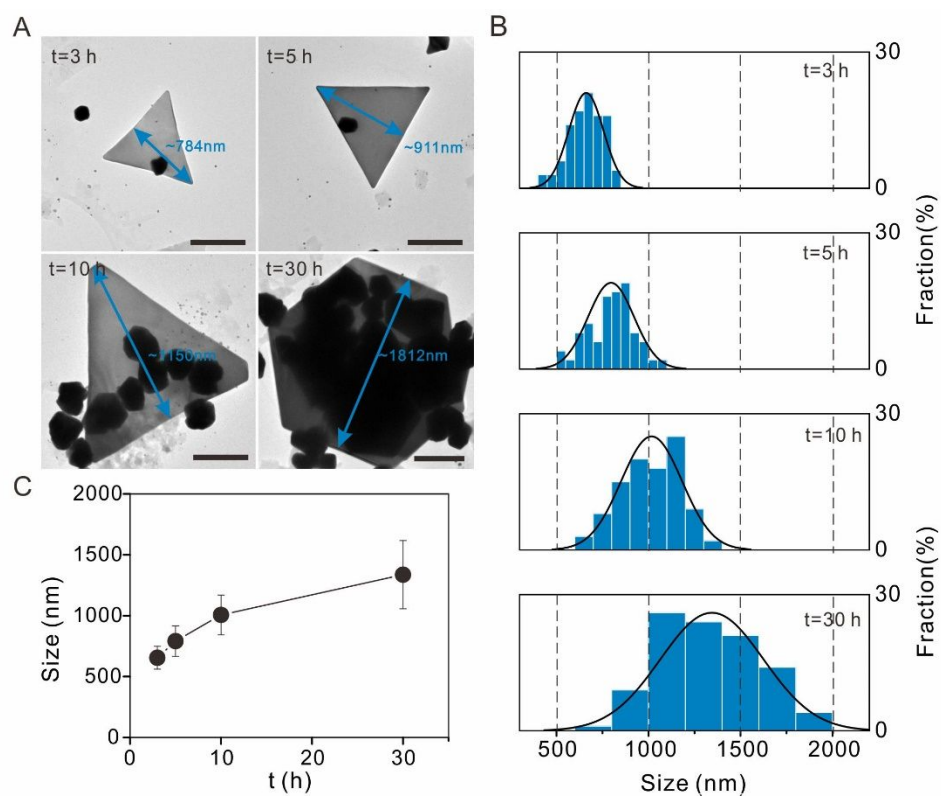


Figure S4. Effect of longer synthesis time on the Au nanoplate size with HAuCl_4 concentration (4 mM). (A) Representative TEM images and (B) size distributions of Au nanoplates of different growth times (3, 5, 10, and 30 h, respectively, $N=100$). Scale bar: 500 nm. (C) Average size of the Au nanoplates plotted as a function of synthesis time.

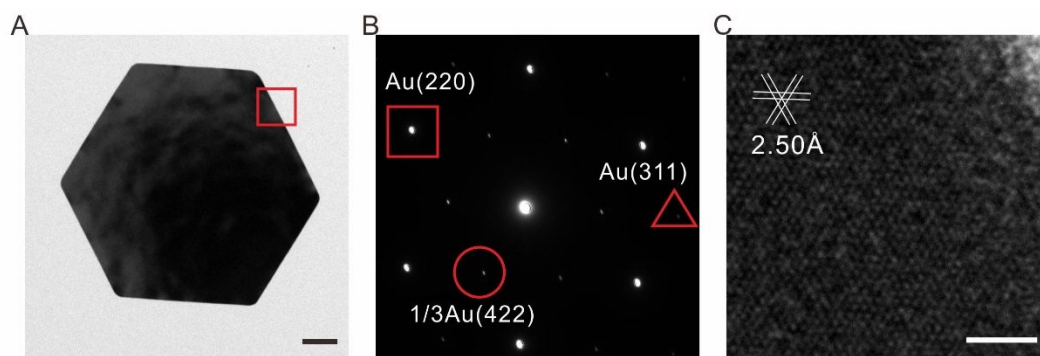


Figure S5. GD-mediated synthesis of Au nanoplates. (A) Representative TEM images of a hexagonal Au nanoplate. (B) SAED pattern from the Au nanoplates in C. The circled spot, boxed spot and spot circumscribed by triangle correspond to allowed $1/3\{422\}$, $\{220\}$ and $\{311\}$ Bragg reflections with lattice spacings of 2.5, 1.44 and 1.23 Å respectively. (C) HRTEM images of the region within the red box in A. Scale bars: (A), 100 nm; (C), 5 nm.

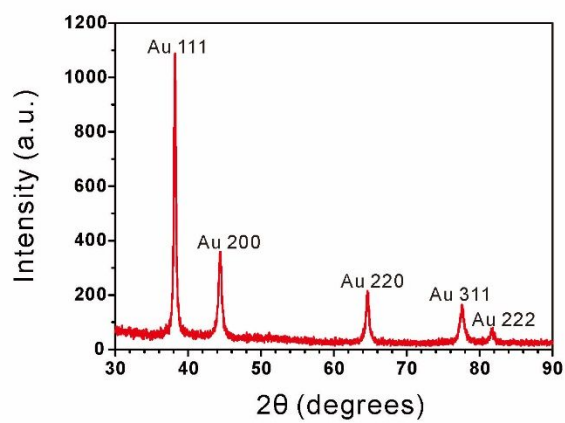


Figure S6. X-ray diffraction (XRD) ω - 2θ scan obtained from air-dried multilayer GD-Au nanoplates. Growth time, 5 h.

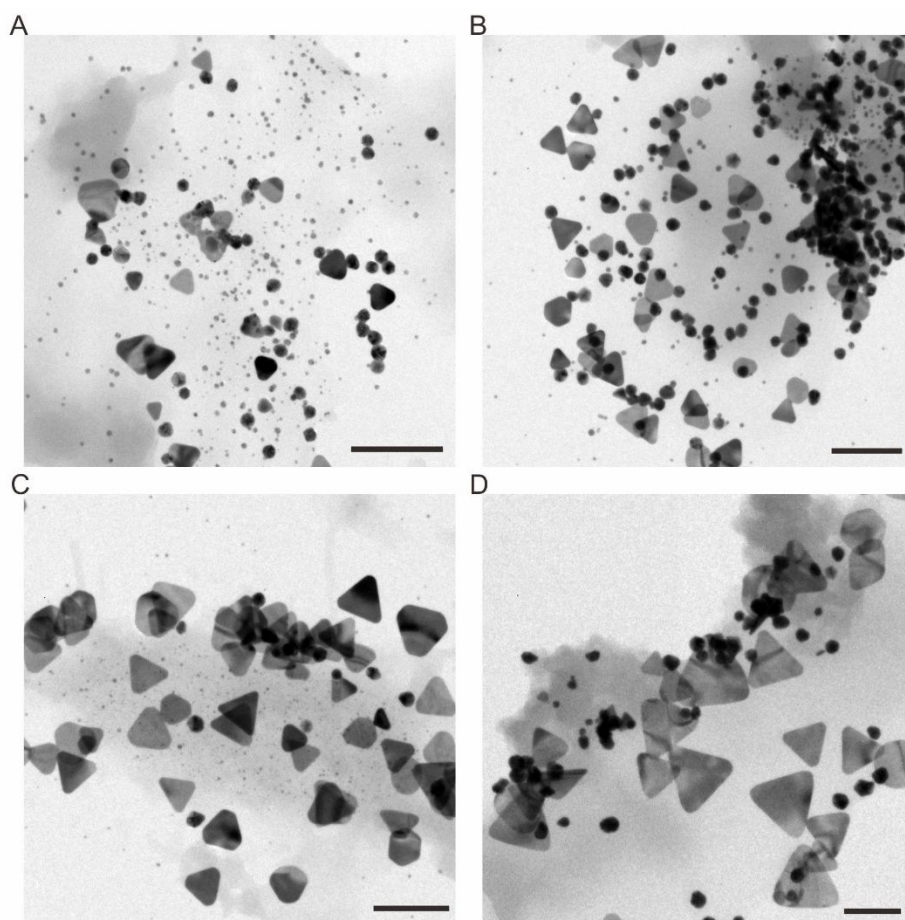


Figure S7. Typical TEM images of the Au nanoplates synthesized on multilayer GD with growth time=10 min (A), 20 min (B), 30 min (C) and 60 min (D). Scale bar: 200 nm.

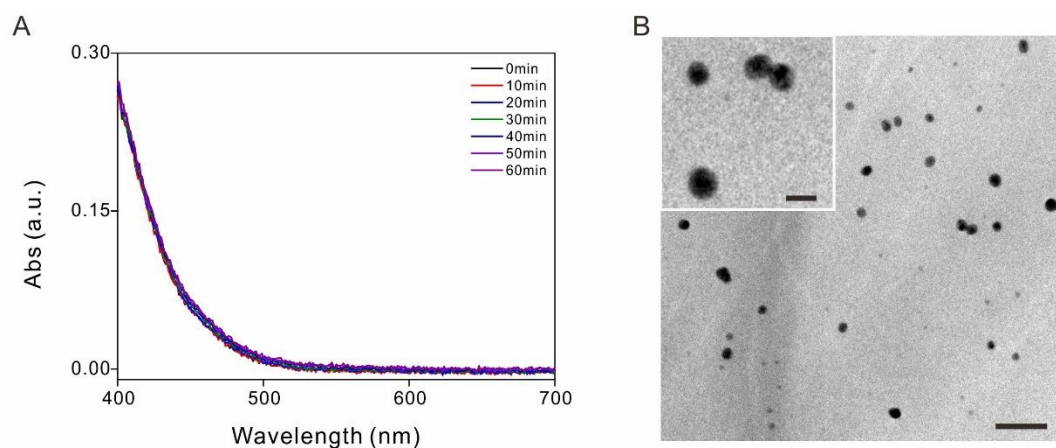


Figure S8. Kinetics of the visible absorption spectra and TEM image of products from graphene oxide (GO) reaction with HAuCl_4 at room temperature. (A) Kinetics of the visible absorption spectra (wavelength, 400~800 nm; growth time, from 10 to 60 min, with 10-min interval). (B) TEM image of products from GO ($200 \mu\text{g ml}^{-1}$) reaction with HAuCl_4 (4 mM) at room temperature. Scale bar: 50 nm.

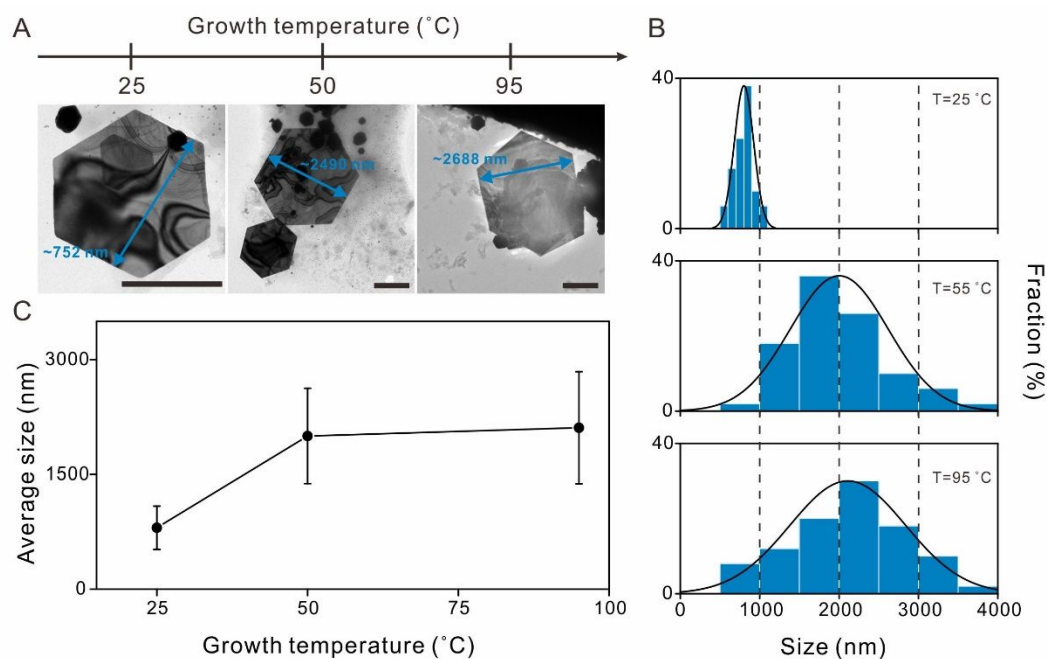


Figure S9. Thermodynamic synthesis of Au nanoplates. (A) Representative TEM images of Au nanoplates with growth temperature, 25, 50 and 95°C respectively, (growth time, 5 h). Scale bar: 500 nm. (B) Corresponding size distributions of Au nanoplates with different growth temperatures. (C) Average size of the Au nanoplates plotted as a function of synthesis temperature. N=100.

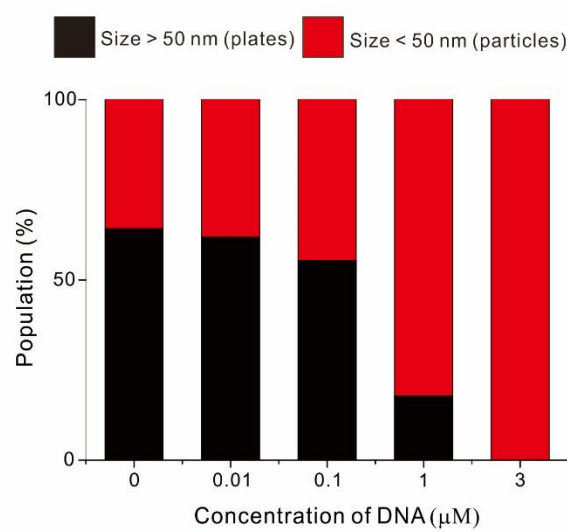


Figure S10. Statistics showing the dependency of the size of Au nanostructures on the concentration of oligonucleotide (A20) from 10 nM to 3 μM. N>300.

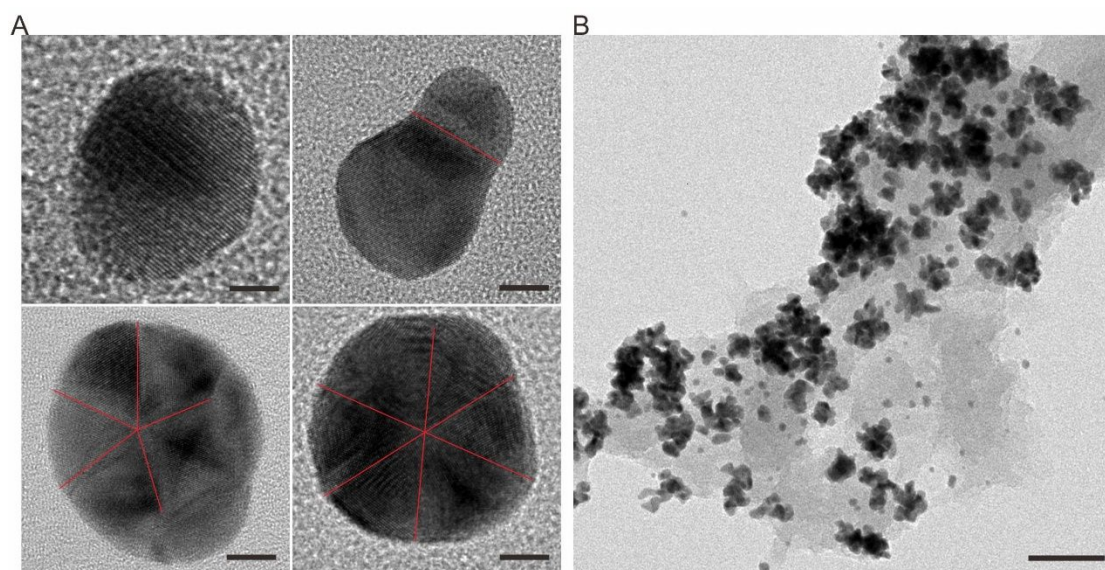


Figure S11. Representative TEM images of polycrystals (A) and the flower-like nanoparticles (B).

Scale bars: (A) 5 nm, (B) 50 nm.