Characterization of Nanoporous Gold Disks for Photothermal Light Harvesting and Light-gated Molecular Release

Supplementary Information

Chemicals and materials used in NPGD fabrication. The alloy sputtering target $Ag_{82.5}Au_{17.5}$ (atomic percentage) is provided by ACI Alloys, INC. 99.999% argon gas was used for RF-sputter-etching. Fusion classic syringe pumps and microliter syringes (250 μl) are purchased from Chemyx Inc. and Hamilton Company, respectively. 3" silicon wafers are from University Wafers and the micro cover glass (22×40 mm, No.1) is purchased from VWR. Ethanol (200 proof) is from Decon Laboratories, Inc. Nitric acid (ACS reagent, 70%), sodium dodecyl sulfate (ACS reagent, ⩾99.0%), chloroform (anhydrous, ⩾99.0%), and Latex beads (polystyrene beads, 10% aqueous suspension) with mean particle sizes 0.6 μm were purchased from Sigma Aldrich.

Thermal Imaging Experiments. The NPGD samples were irradiated in water and air media at 1-minute intervals using a tunable NIR continuous wave (CW) laser (2 mm diameter beam, 100 mW/mm^2, 700-900 nm, 3900s Spectra Physics). In the water-bathed experiments, thermal maps were acquired from the backside of the glass chamber wall (Figure S1A) at a slight angle to prevent damage to the infrared camera. In the air-ambient experiments, the thermal maps were acquired from the backside of the glass substrate on which the NPGDs were deposited on the opposite side (Figure S1B). The thermal images were acquired using a thermographic camera (FLIR A320G). Thermographic acquisitions were done for two-minutes where the laser was turned on at t = 15 s and turned off at t = 75 s.

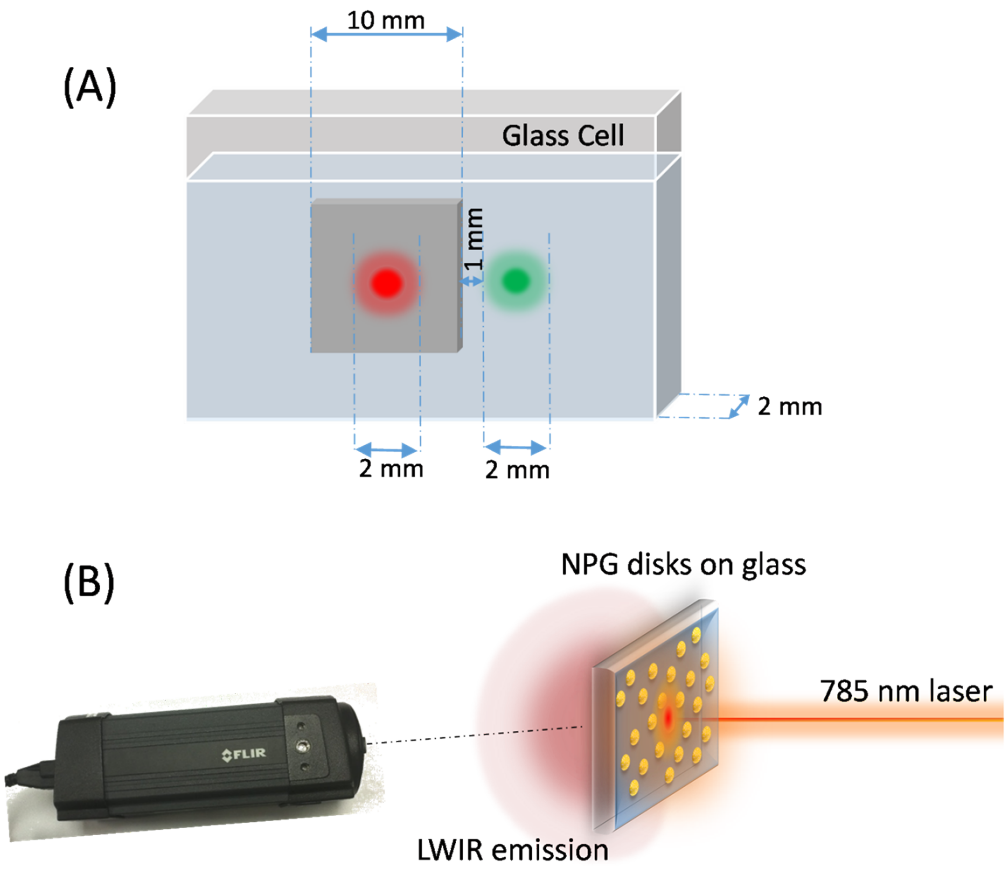

Figure S1. (A) Schematic diagram of the glass chamber. The dimensions of the glass container and the NPGD sample are as specified. Red beam spot represents the NIR laser spot used for photothermal irradiation. Green beam spot represents the 532-nm laser spot used for the downstream fluorescence measurements. (B) Schematic diagram of thermal imaging experiments of solid NPGD array in air medium.

Scanning Electron Microscope Images and Extinction Spectra of NPGD. The NPG disks were characterized by a scanning electron microscope (PHILIPS FEI XL-30 FEG SEM). A Cary 50 Scan UV-visible spectrometer was used to measure the UV-vis spectra ranging from 400 to 1000 nm, and the NIR region from 915 to 3000 nm was recorded by Bruker Tensor 27 FT-NIR spectrometer.

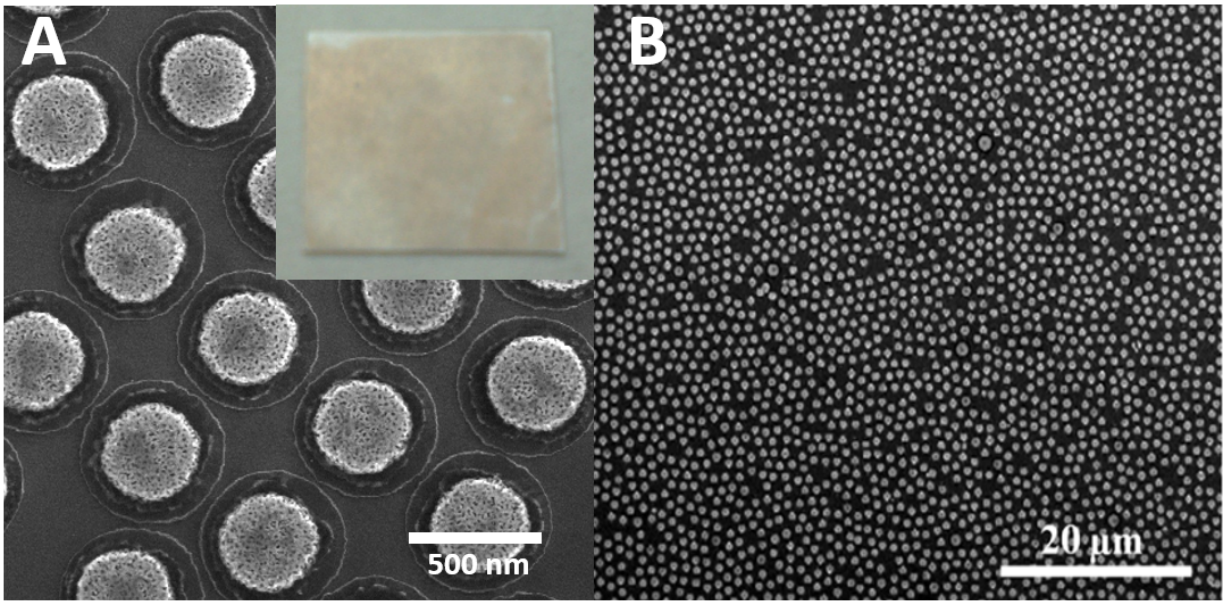

Figure S2. (A) SEM image of substrate-bound NPGD with 400 nm diameter and 75 nm thickness. Inset image is corresponding photograph of NPGD samples on glass coverslip. (B) Optical image of substrate-bound NPGD at lower magnification.

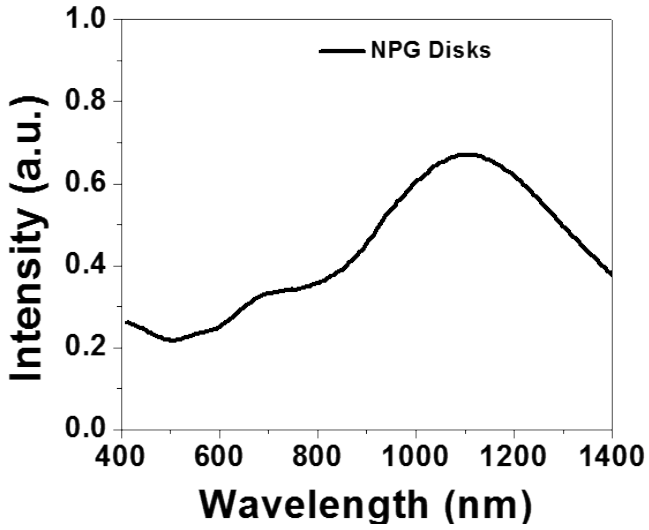

Figure S3. Normalized extinction spectra of NPG disks in air (*n*=1).

Material	Au	Glass
Mass (grams)	4.85×10^{-6}	0.03765
Specific heat constant, c ($J\ g^{-1}\ K^{-1}$)	0.126	0.840

	Irradiated Spot (2 mm)	**Entire Sample**
Estimated number of NPGD particles	2.54×10^{6}	8.08×10^{7}

Table S1. Calculated average mass of materials (in grams) in each sample and corresponding specific heat constants for a 10 x 10 mm^2 NPGD sample on glass coverslip. Estimated number of NPGD particles in a 10 x 10 mm^2 sample using representative optical image in Figure S2B.

Wavelength (nm)	I_{refl} (mW)	I_{trans} (mW)	I_{abs} (mW)
700	64.9	111.5	123.6
725	65.8	108.9	125.3
750	65.4	107.5	127.1
775	65.6	105.4	129.0
785	65.0	105.0	130.0
800	66.1	101.6	132.3
825	63.7	98.4	137.9
850	63.9	91.5	144.6
875	64.0	80.2	155.8
900	64.3	67.7	168.0

Table S2. Power measurements for light absorption at different wavelengths (700-900 nm) obtained from reflected and transmitted power readings (Ophir PD-300-1W) with a 300 mW irradiation source.