Supporting Information

Gold-based Nanostructures for Efficient NIR-II Photothermal Conversion: Hybridizing Nanoplates with Solid/Hollow Nanospheres

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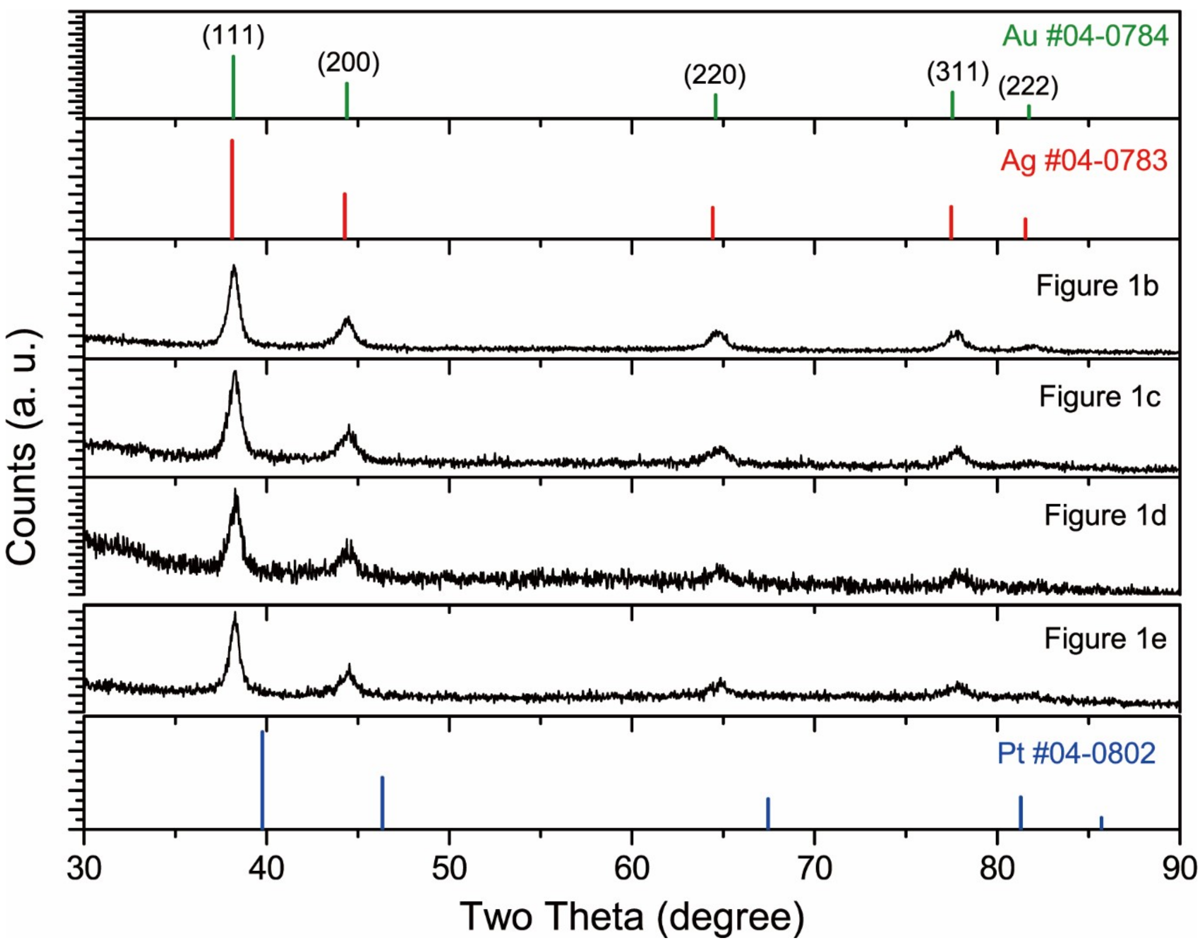

Figure S1. XRD patterns of products shown in Figure 1. Standard peaks of Au, Ag, and Pt are provided for reference.

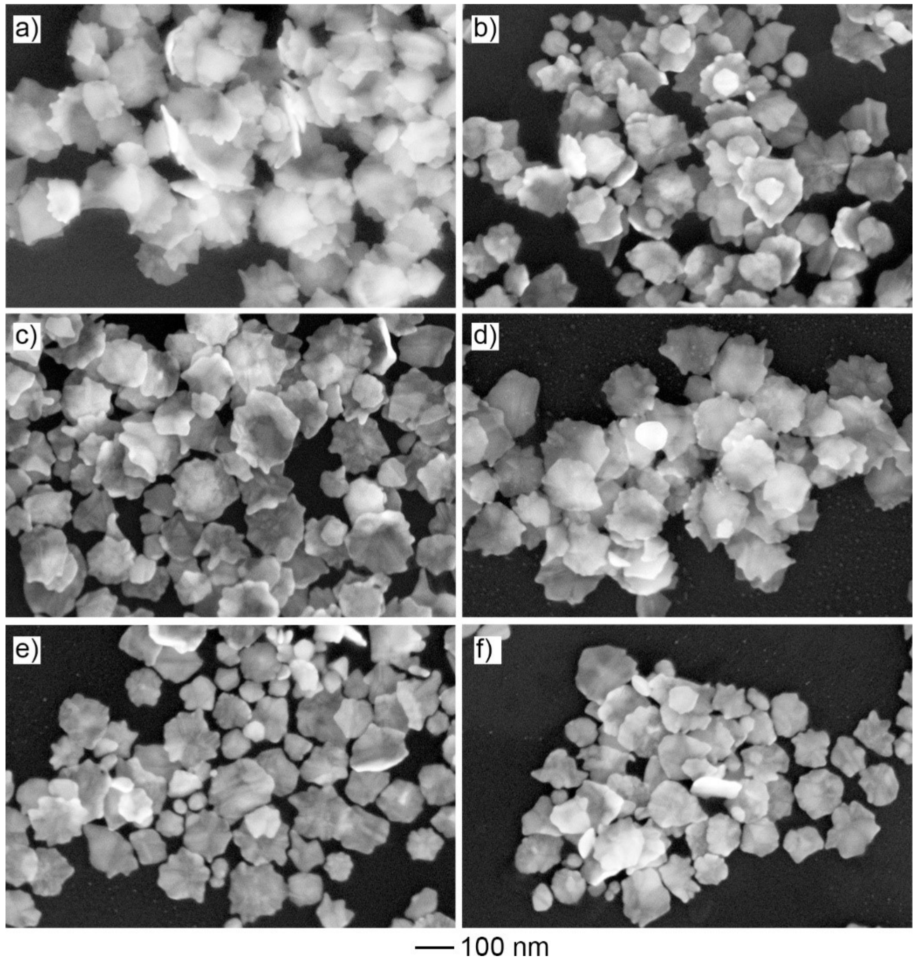

Figure S2. SEM images of product obtained *via* the standard procedure, except for the direct use of plate-like Au seeds without surface doping and the extra addition of a-d) aqueous KI (100 mM) solution at the volume of: a) 0, b) 20 μL, c) 300 μL, d) 1000 μL, respectively; e) 100 μL of aqueous KCl (100 mM) solution; f) 100 μL of aqueous KBr (100 mM) solution.

Table S1. Information of chemicals and materials used in the present study.

Name	Abbr.	Purity	Supplier
gold(III) chloride trihydrate	$HAuCl_4 \cdot 3H_2O$	99.9%	Aladdin Chemical (Shanghai, China)
silver nitrate	$AgNO_3$	99.8%	
potassium hydroxide	KOH	95%	
potassium chloride	KCl	≥99%	
Potassium bromide	KBr	≥99%	
potassium iodide	KI	≥99.0%	
ascorbic acid	AA	99.0%	
cetyltrimethylammonium bromide	CTAB	99%	
Water	/	18.2 MΩ cm	Made by Ulupure Ultrafiltration System

Table S2. Information of characterization techniques in the present study.

Technique	Abbr.	Model No.	Operation details
High-resolution TEM	HRTEM	TALOS F200X microscope (FEI)	accelerating voltage: 200 kV
high angle annular dark field-scanning transmission electron microscopy	HAADF-STEM		
Energy dispersive X-Ray Spectroscopy	EDS		
Scanning electron microscopy	SEM	Ultra60 microscope (Zeiss)	accelerating voltage: 12 kV
X-ray photoelectron spectroscopy	XPS	Thermo Scientific ESCALAB 250Xi XPS	monochromatic Al K_{α} radiation ($h\nu$=1486.6 eV)
UV-vis-NIR extinction spectroscopy	/	UV2310II (Techcomp, Shanghai)	/

Table S3. Lateral size of the plate part of the products shown in Figure 1.

Sample No.	average value (nm)	standard deviation (nm)
Figure 1b	110.7	15.8
Figure 1c	114.7	18.9
Figure 1d	130.9	30.1
Figure 1e	84.2	19.0

Data recording method for thermal imager

Firstly, connect the thermal imager (FOTRIC 220s) with PC AnalyzIR software, and open the working area of the FOTRIC 220s to ensure that the interface of software can record data. Then, adjust the lens of the thermal imager to align vertically with the sample (a vertical distance of 15 cm) to ensure that the sample image can be collected. Turn on the 808 nm laser (1 W cm^{-2}) with the vertical distance between the light source and the sample at 15 cm and start recording data with AnalyzIR software at the same time. After that, AnalyzIR software thermal image working area was used for data processing.

Evaluation of Photothermal Performance.

To evaluate the photothermal performance of different materials, 350 μL of Au NPs, Au@Ag CSNPs, AuPtAg SSOP, and AuPtAg HSOP was placed in 96-well plates and irradiated with a 1064 nm laser (0.5 W cm^{-2}), respectively. The real-time temperature of each sample was recorded every 20 s using a thermal imager (FOTRIC 220s). Meanwhile, the photothermal stability of the AuPtAg HSOP (1064 nm, 0.33 W cm^{-2}) under five consecutive laser on/off cycles were also evaluated by the same method. A photothermal conversion efficiency (η) of 55.4% was calculated according to the following formula[1]:

$$\eta = \frac{hA\,(\Delta T_{max} - \Delta T_{H_2O})}{I\,(1 - 10^{-A_{1064}})} \times 100\% \tag{1}$$

where h is the heat transfer coefficient, A is the surface area for radiative heat transfer, ΔT_{max} represents the maximum steady-state temperature in the presence of AuPtAg HSOP relative to room temperature, ΔT_{H2O} represents the maximum steady state temperature of water relative to room temperature, I is the power density of used laser, and A_{1064} is the absorbance at 1064 nm.

Reference

1. Roper, D. K.; Ahn, W.; Hoepfner, M., Microscale Heat Transfer Transduced by Surface Plasmon Resonant Gold Nanoparticles. *Phys. J. Chem. C* 2007, 111(9): 3636–3641, **DOI:** 10.1021/jp064341w.