Supplementary Information (SI) for Materials Advances.
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Supplementary information

Eradiation of planktonic bacteria by shape-tailored gold nanoparticle photothermia

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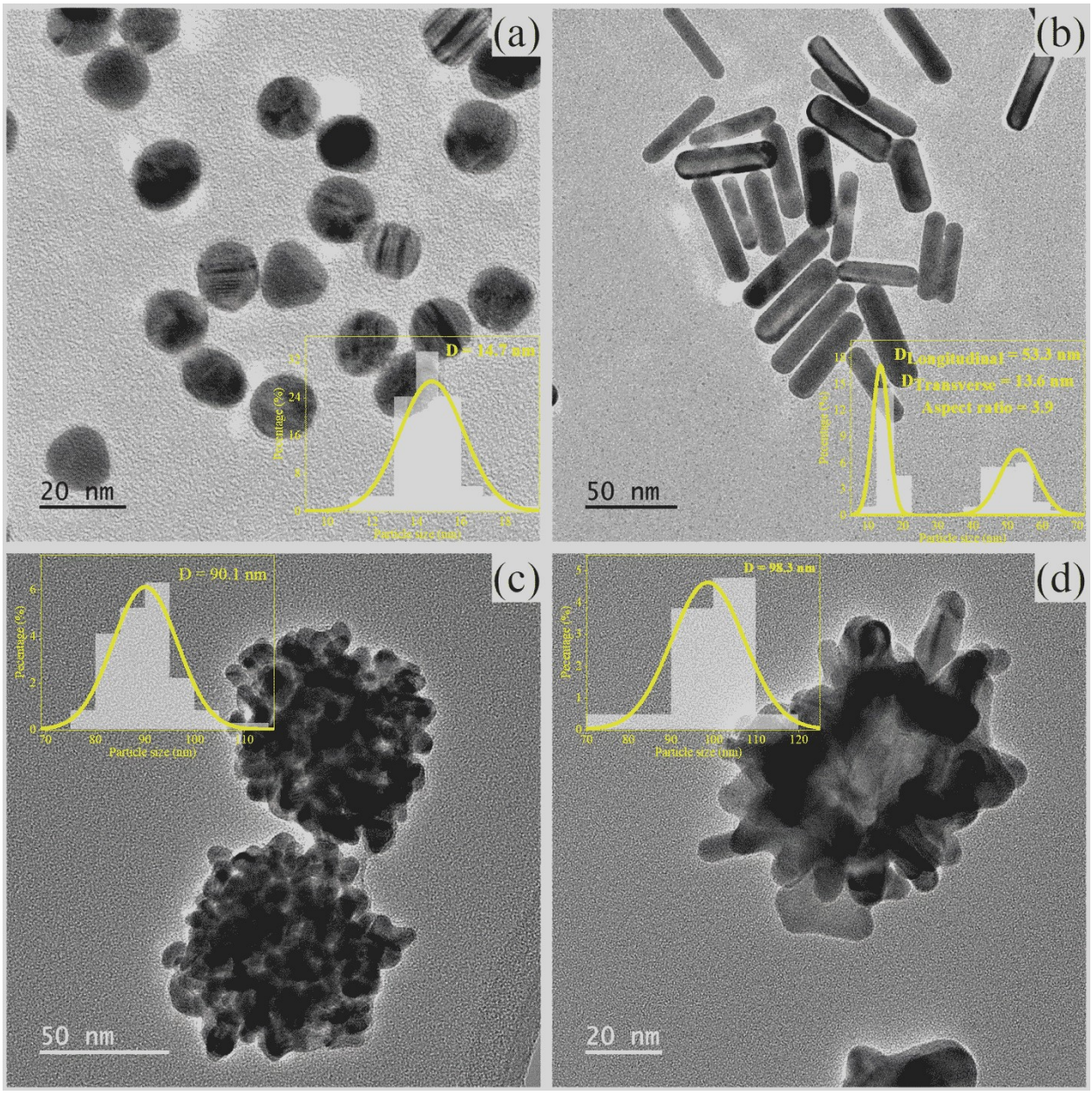

Figure S 1. TEM images of (a) AuNSP-citrate, (b) AuNRO-CTAB, (c) AuNFL-dopamine and (d) AuNST-PVP; insert figures are their size distributions.

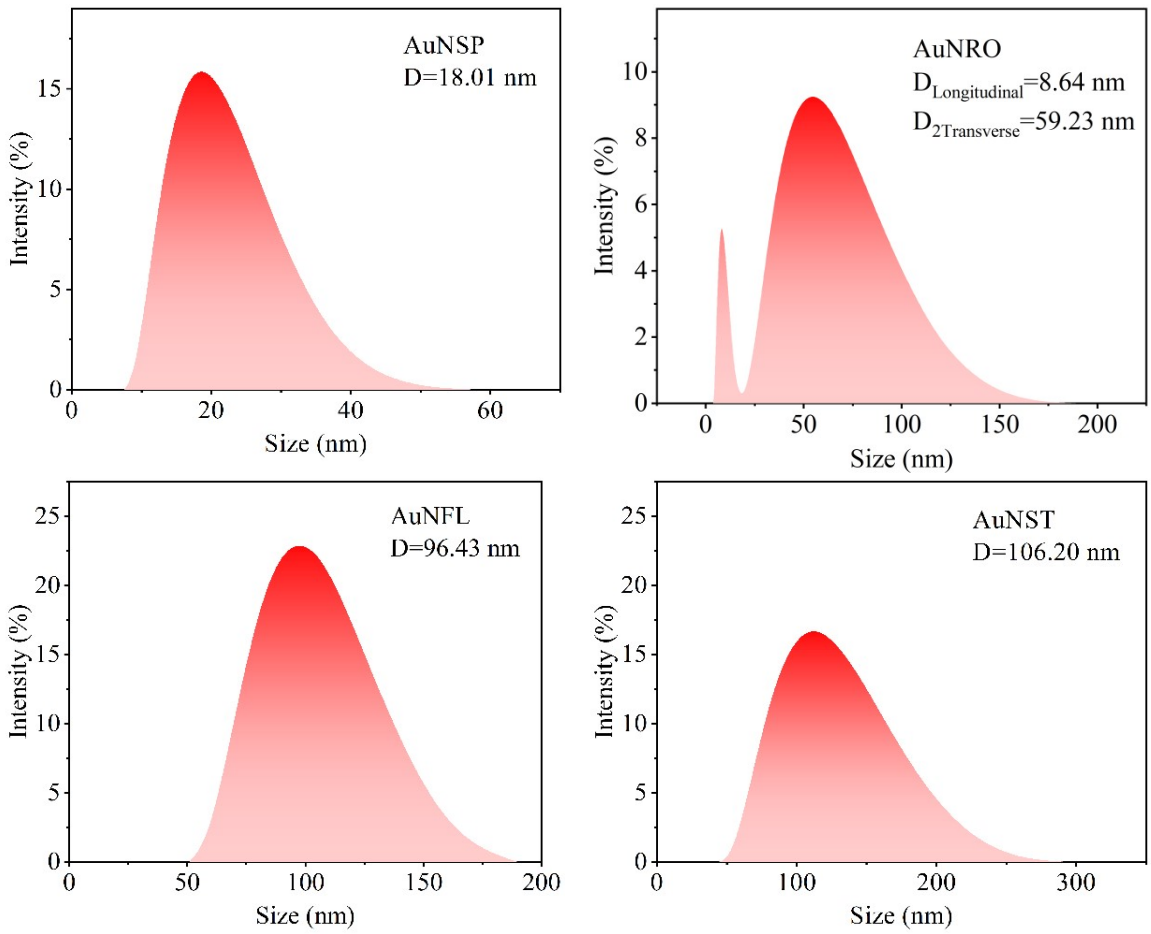

Figure S 2. Hydrodynamic diameters of AuNSP-citrate, AuNRO-CTAB, AuNFL-dopamine and AuNST-PVP, measured by DLS.

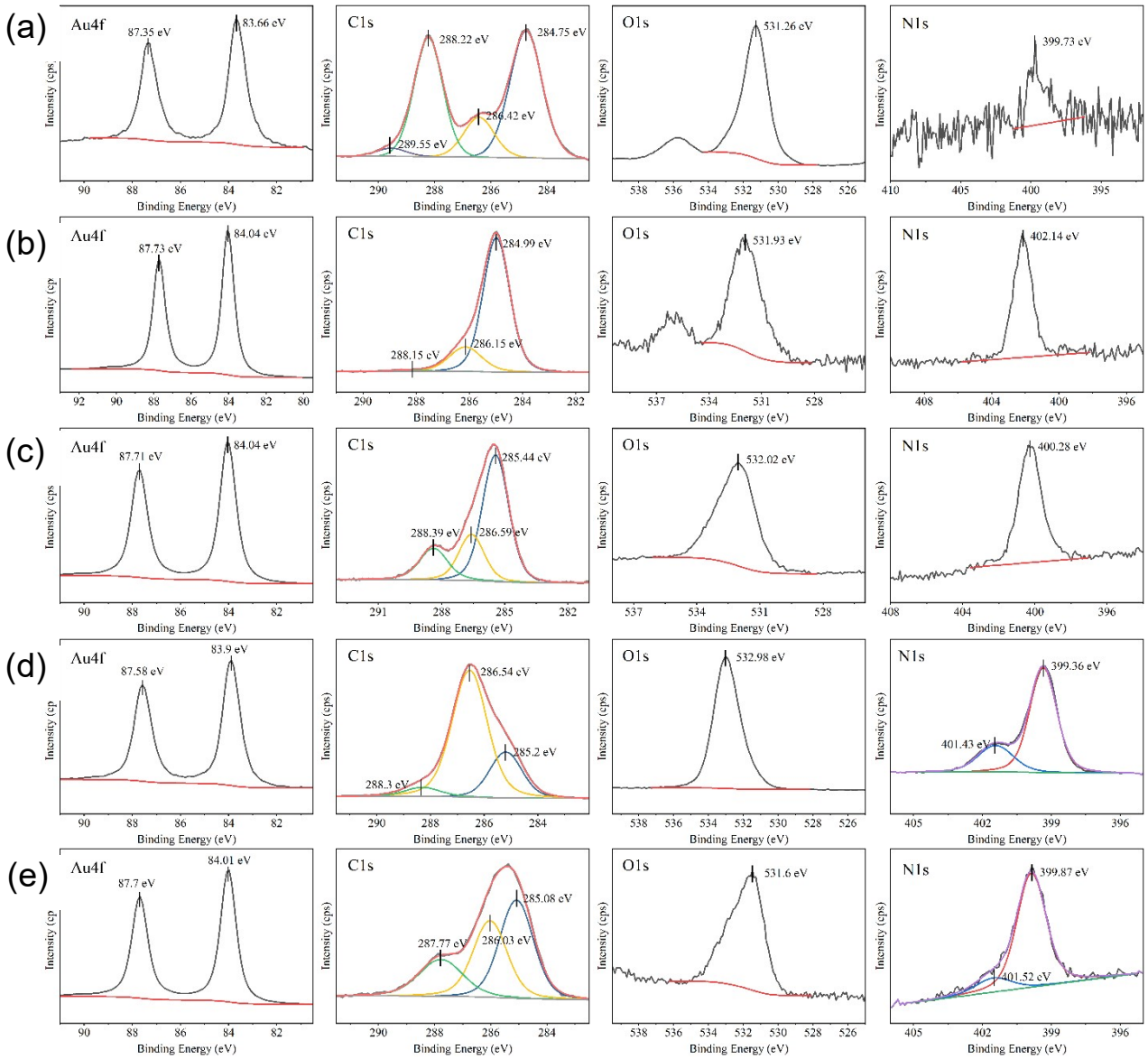

Figure S 3. XPS high-resolution spectra of Au4f, C1s, O1s and N1s of (a) AuNSP-citrate, (b) AuNRO-CTAB, (c) AuNRO-citrate, (d) AuNFL-dopamine, and (e) AuNST-PVP.

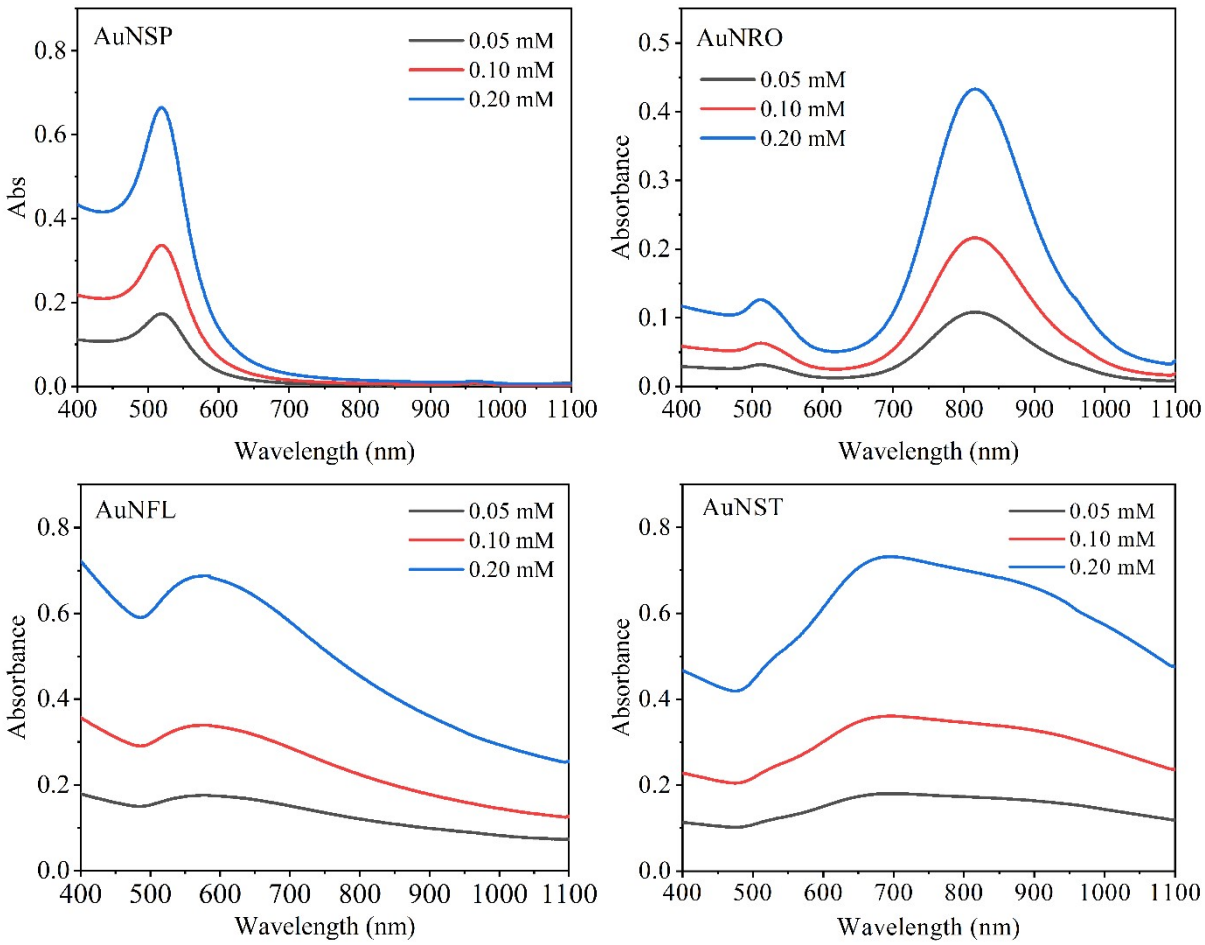

Figure S 4. Vis-NIR absorption spectra of AuNSP-citrate, AuNRO-CTAB, AuNFL-dopamine and AuNST-PVP (400~1100 nm); [Au^0] from 0.05 mM to 0.2 mM.

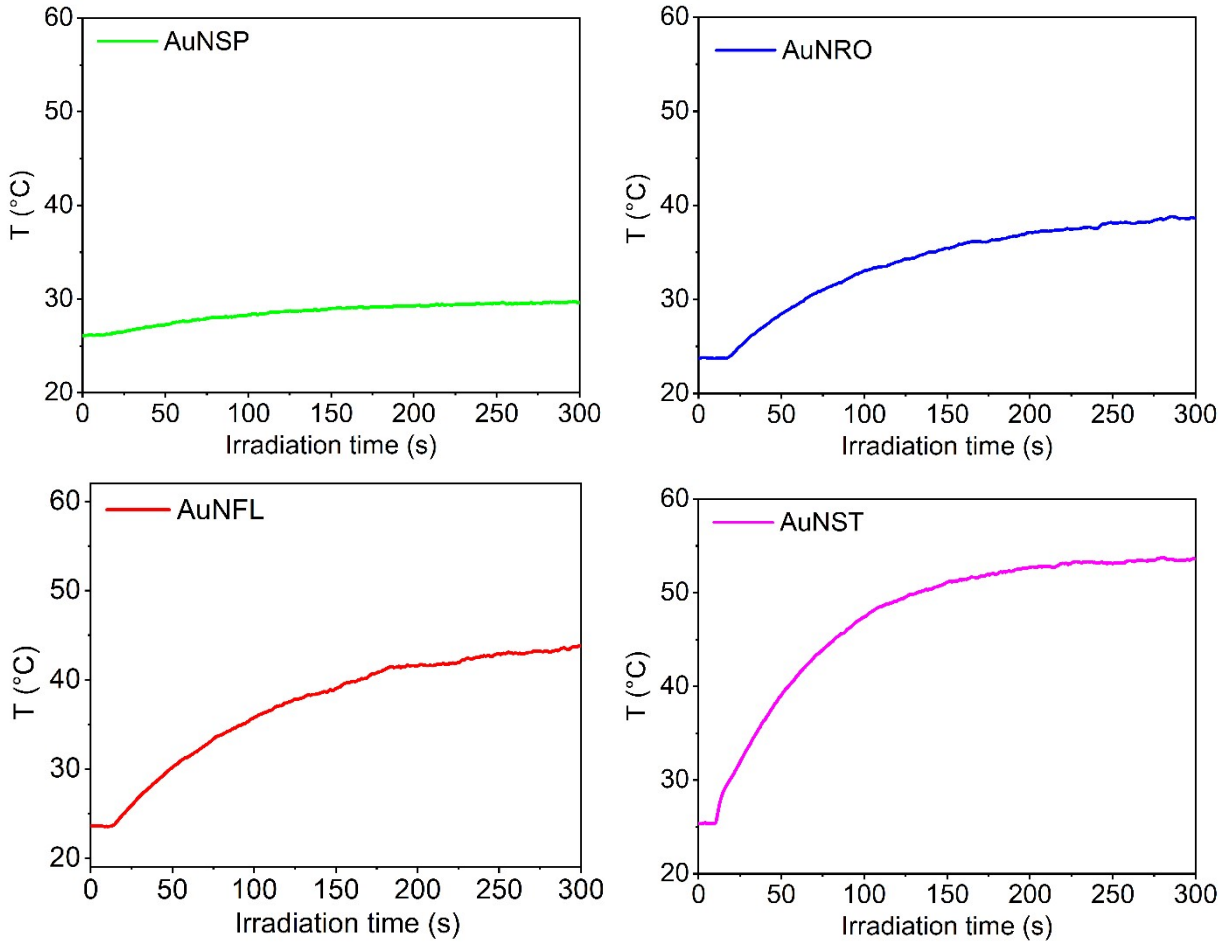

Figure S 5. Photothermal heating of AuNSP-citrate, AuNRO-CTAB, AuNFL-dopamine and AuNST-PVP; [Au^0] = 0.2 mM, irradiation at 808 nm, power = 0.3 W.

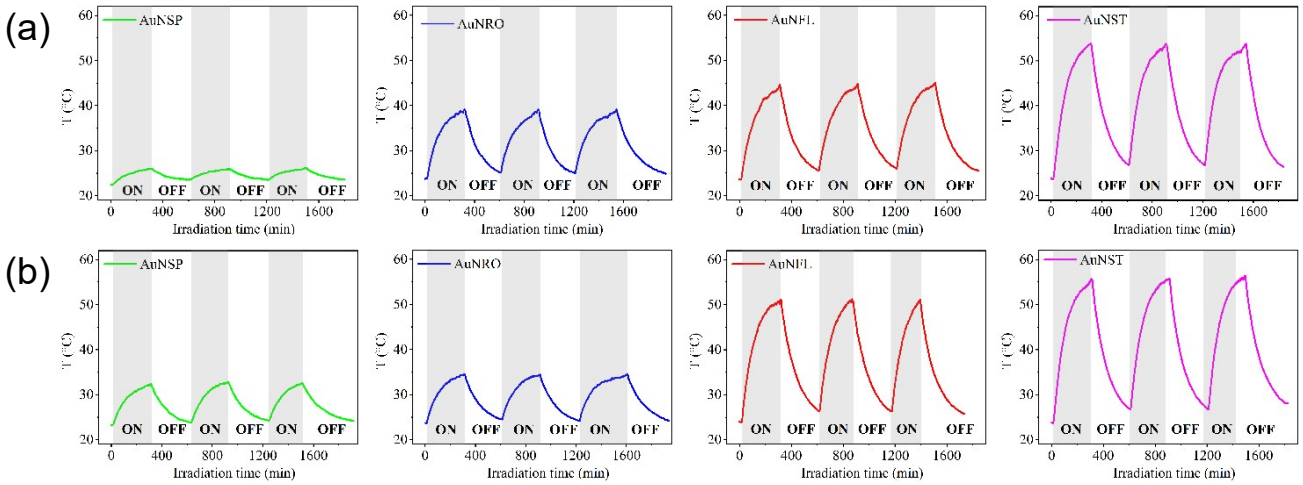

Figure S 6. Photothermal stability of AuNSP-citrate, AuNRO-CTAB, AuNFL-dopamine and AuNST-PVP over 3 cycles; [Au^0] = 0.2 mM, irradiation at (a) 808 nm and (b) 1064 nm, power = 0.3 W.

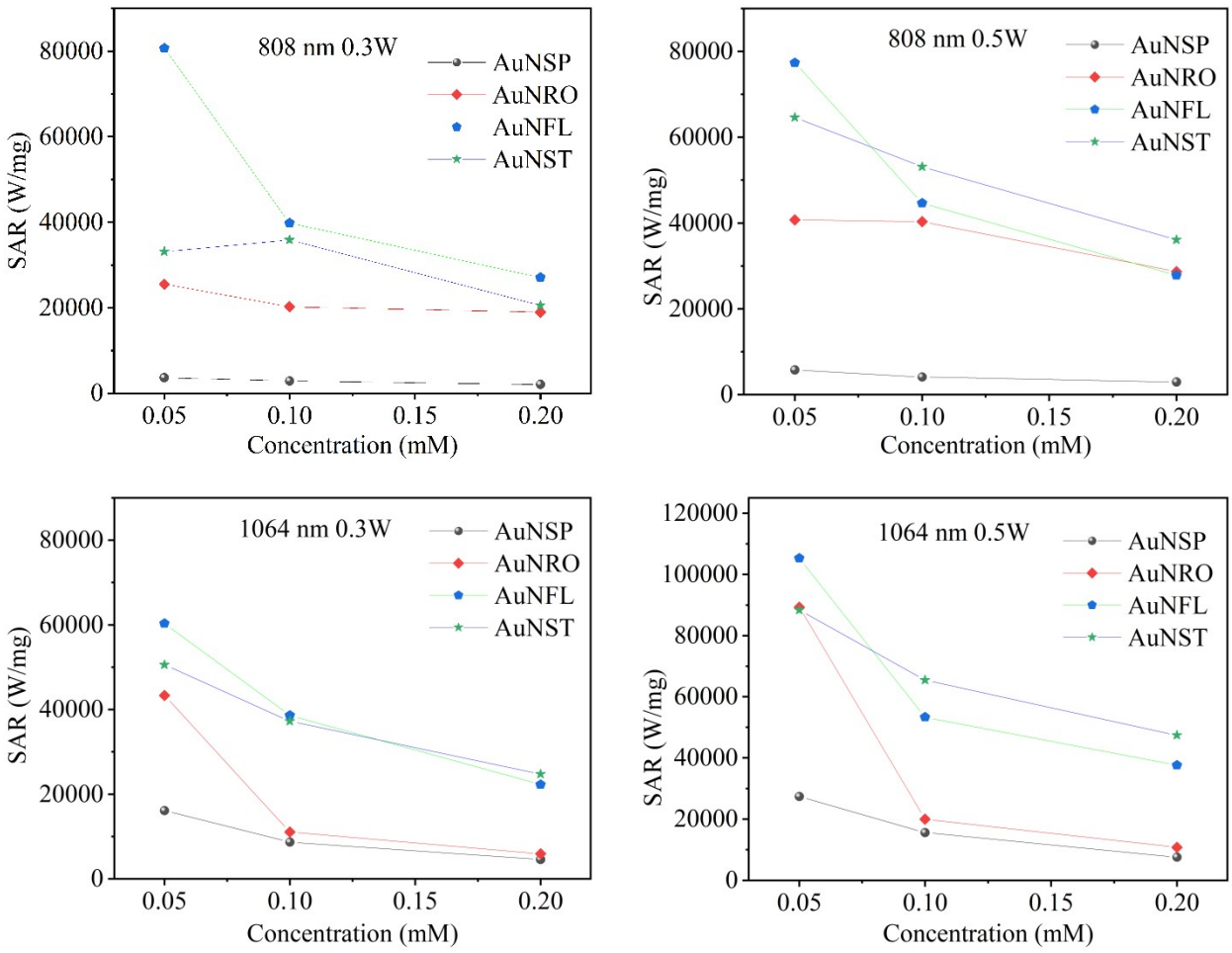

Figure S 7. Specific absorption rates (SAR) of AuNRO-CTAB, AuNFL-dopamine and AuNST-PVP; irradiation at 808 and 1064 nm, power = 0.3 and 0.5 W.

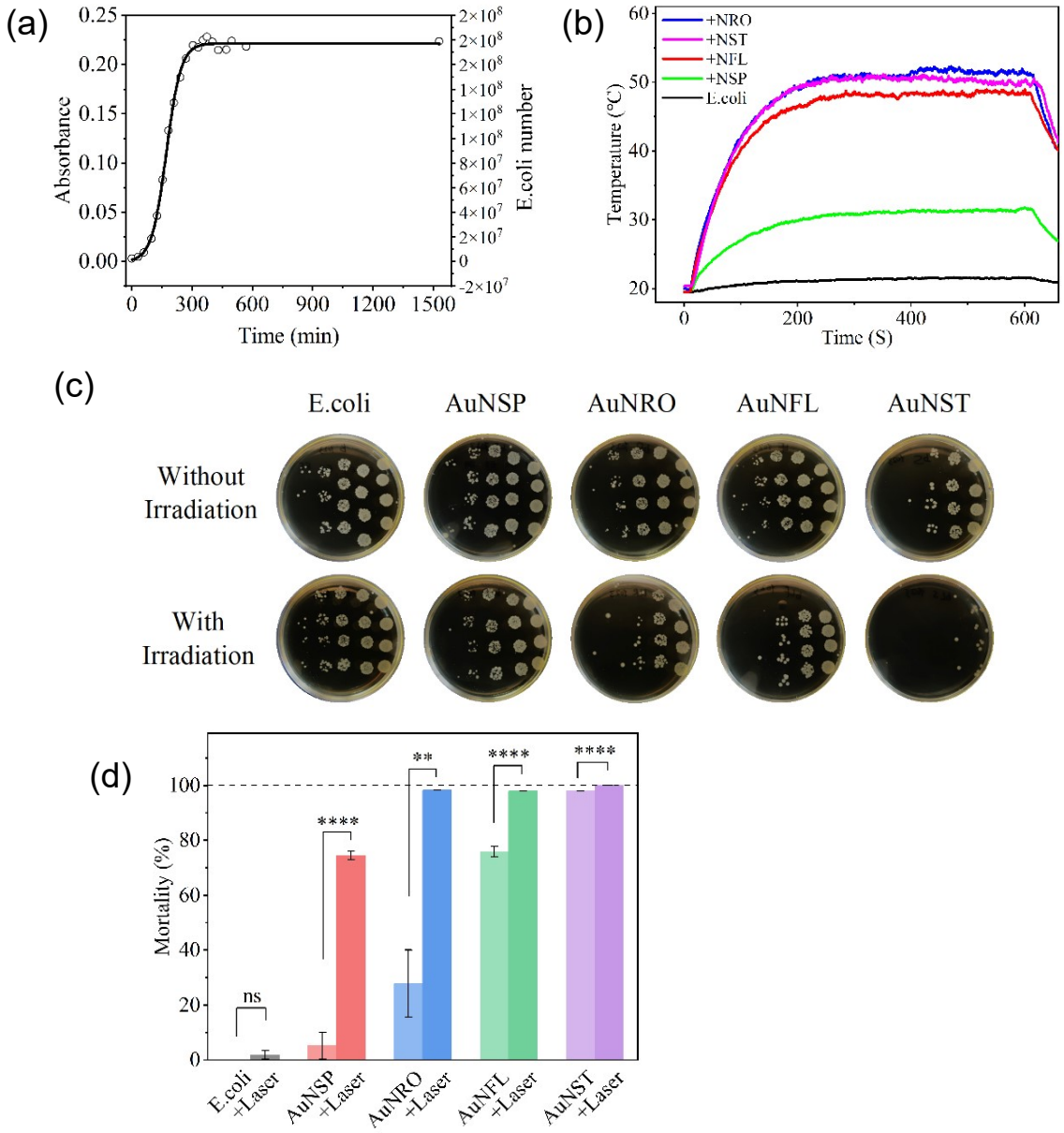

Figure S 8. (a) Growth curve of *E. coli*. (b) Photothermal heating of mixtures of AuNSP-citrate, AuNRO-citrate, AuNFL-dopamine and AuNST-PVP with *E. coli*; irradiation at 808 nm, power = 0.3 W. (c) Petri dishes with different concentrations of the mixtures, with and without photothermal heating. (d) % Mortality.

Table S 1. Comparative analysis of photothermal capacities of AuNFL-dopamine and AuNST-PVP at 1064 nm, power = 0.3 W and 0.5 W.

1064 nm	**Power**	**[Au^0]**	**ΔT**	**SAR**	τ_h	η_h	τ_c	η_c	η_{mean}
	W	**mM**	**°C**	**W g^{-1}**	**sec**	**%**	**sec**	**%**	**%**
AuNFL	0.3	0.2	21.4	22310	125	53	98	85	69
		0.1	21.1	38700	132	86	93	-*	-*
		0.05	16.5	60300	143	-*	113	-*	-*
	0.5	0.2	34.5	37600	104	61	91	95	78
		0.1	28.4	53300	111	83	92	-*	-*
		0.05	27.3	105300	152	95	106	-*	-*
AuNST	0.3	0.2	27.2	24700	108	51	101	65	58
		0.1	20.2	37300	109	59	107	72	65
		0.05	14.0	50600	127	61	127	81	71
	0.5	0.2	40.8	475000	103	48	82	74	61
		0.1	31.0	65400	109	54	94	77	65
		0.05	23.8	88400	108	73	116	86	79

* The photothermal conversion efficiency could not be calculated accurately.

Table S 2. Bacterial population variation (in number and ΔLog) and mortality after incubation of *E. coli* with different AuNP suspensions (AuNSP-citrate, AuNRO-citrate, AuNFL-dopamine and AuNST-PVP), with and without photothermal heating.

		Blank	AuNSP	AuNRO	AuNFL	AuNST
E.coli number (CFU/mL)	Without irradiation	3.53E+07 ±2.67E+06	3.35E+07 ±1.71E+06	2.55E+07 ±4.35E+06	8.53E+06 ±6.96E+05	6.80E+05 ±2.45E+04
	With irradiation	3.47E+07 ±5.44E+05	9.00E+06 ±5.34E+05	5.95E+05 ±3.70E+04	6.85E+05 ±2.28E+04	1.00E+04 ±1.58E+03
ΔLog* (CFU/mL)	Without irradiation	-	-0.02	-0.14	-0.62	-1.72
	With irradiation	-0.02	-0.59	-1.77	-1.71	-3.55
Mortality (%)	Without irradiation	-	5.2±4.8	27.8±12.3	75.9±2.0	98.1±0.1
	With irradiation	1.9±1.5	74.5±1.5	98.3±0.1	98.1±0.1	100±0.0

* 1-log represents 90% reduction in *E. coli* numbers; 2-log represents 99% reduction; 3-log represents 99.9% reduction; 4-log represents 99.99% reduction.