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Electronic Supplementary Information

Heterostructure made from Bone-like Plasmonic Au Nanoantennas and ZnO Quantum Dots for Broadband Photodetectors

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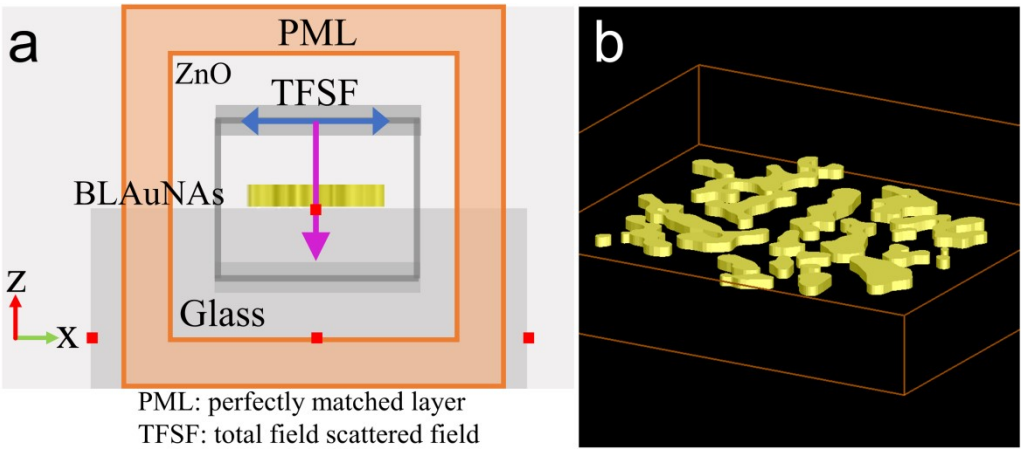

Figure S1. (a) Schematic setup and boundary absorption conditions used for the simulation of electromagnetic field around the BLAuNA2/ZnO heterostructure. (b) BLAuNAs model with a height of 60 nm used for the FDTD simulation.

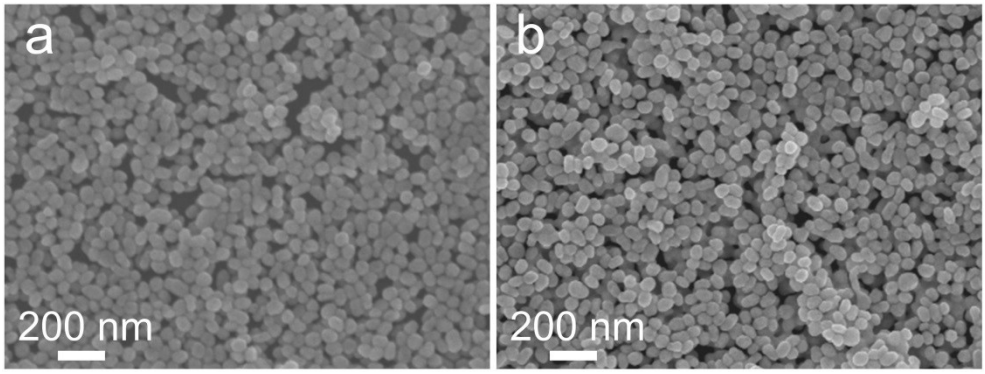

Figure S2. SEM images of (a) 2- and (b) 3-ML Au NP films.

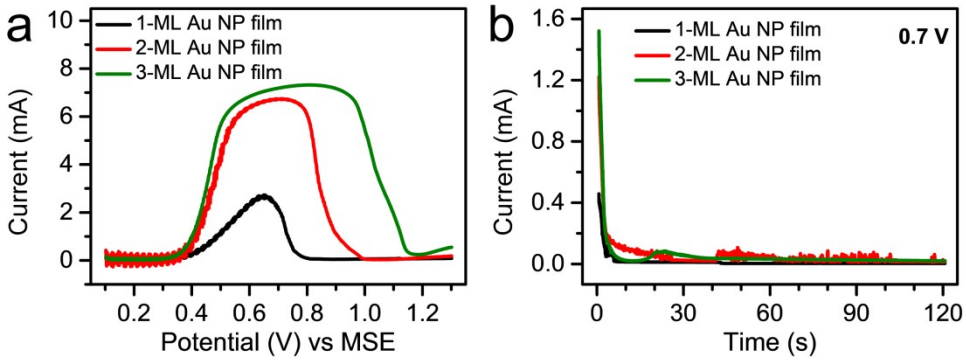

Figure S3. (a) Linear scan curves and (b) chronoamperometric curves for the 1-, 2-, and 3-ML Au-NP films at 0.7 V (vs. MSE) in a 0.5 M KCl solution.

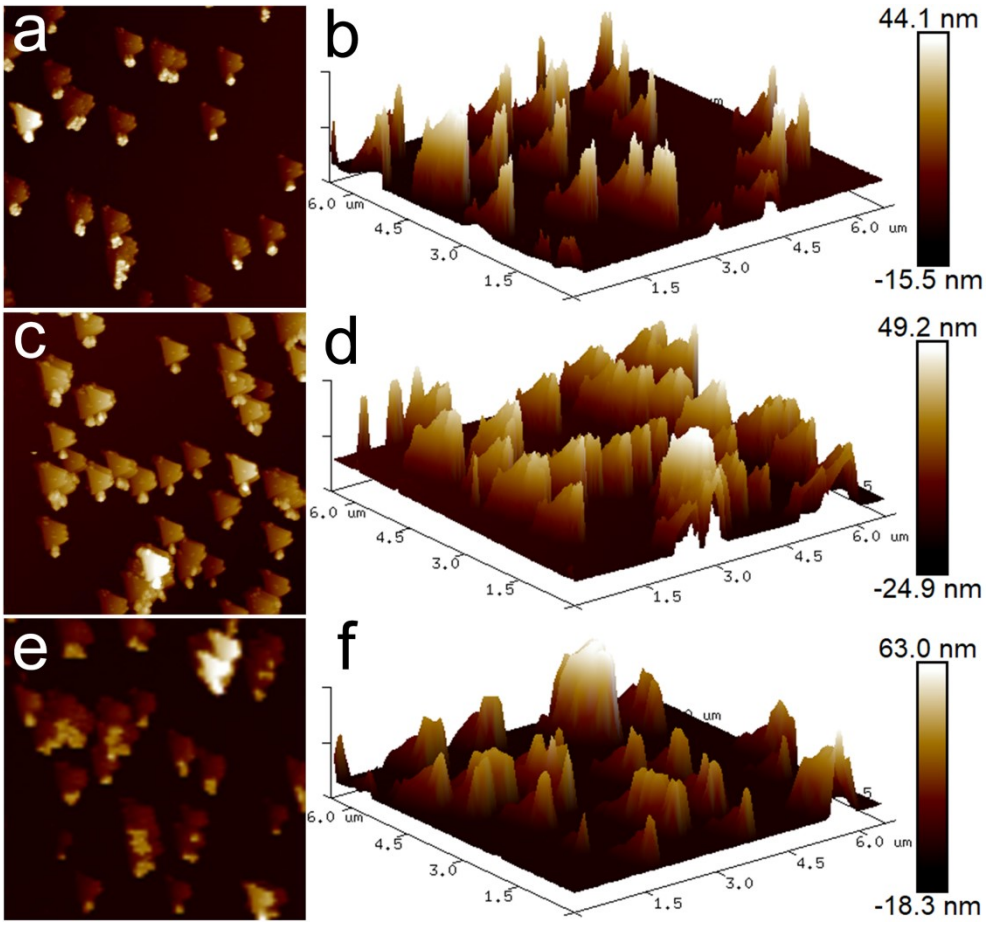

Figure S4. (a, c, and e) top-view and (b, d, and f) side-view AFM images of the (a, b) 1-, (c, d) 2-, and (e, f) 3-ML AuNP films after electrochemical treatment at 0.7 V (vs. MSE) in 0.5 M KCl solution for 120 s.

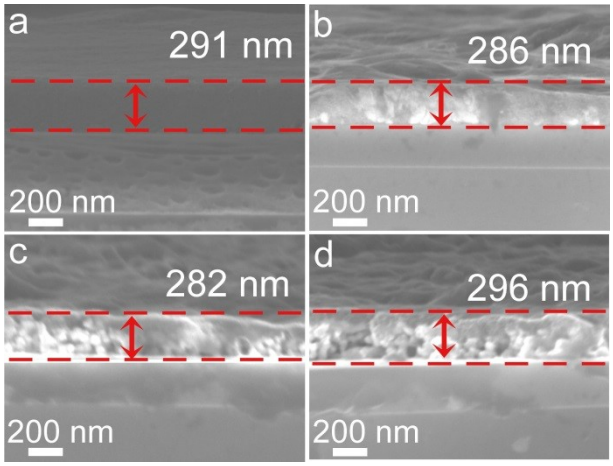

Figure S5. Cross-sectional SEM images of (a) pristine ZnO QDs film, (b) BLAuNA1/ZnO heterostructure, (c) BLAuNA2/ZnO heterostructure, and (d) BLAuNA3/ZnO heterostructure.

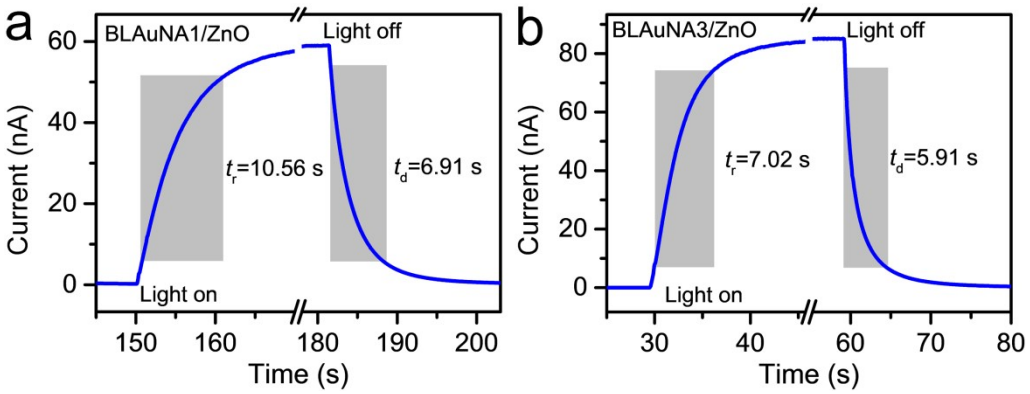

Figure S6. Rise/decay time of (a) the BLAuNA1/ZnO heterostructures photodetector and (b) the BLAuNA3/ZnO heterostructures photodetector under the illumination of the 365 nm light (16.9 mW/cm^2) at a bias voltage of 5 V.

Table S1. Comparison of the performance of the current BL-AuNA2/ZnO heterostructures photodetector and other photodetectors made from semiconductor materials combined with plasmonic nanostructures.

Materials	Light source (nm)	Bias (V)	R (mA/W)	t_r (s)	t_d (s)	EQE (%)
p-ZnO−Au[1]	245	5	−	24	15	−
Au NPs/$CdMoO_4$ microplates/ZnO film[2]	350	5	321.1	16	9.2	−
ZnO/Au nanoantennas[3]	365	10	231.4	3.55	1.49	78.8
Au–NPs/MoO_3/Si[4]	420	1	0.0035	0.035	0.038	−
Au NPs/IZO PD[5]	410 515	1	~100 ~0.2	−	−	−
Au-ZnO nanocomposite[6]	UV 550	5	~60 ~0.37	−	−	−
Au NPs/p-ZnO NSs/n-ZnO[7]	365 520	1	25.4 0.58	~70 −	~150 −	~8.7 −
Au NPs/TiO_2/ZnO:Y NWs[8]	365 525	1	14.8 ~1	＜1 ~94	~30 ~187	5.1 −
BL-AuNA2/ZnO heterostructures (this work)	365 532	5	61.4 ~0.05	8.9 6.5	8.4 20	21.8 11.3

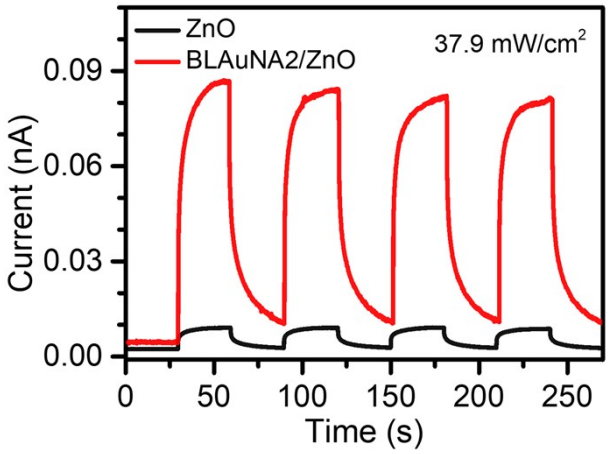

Figure S7. *I–t* response of the pure ZnO QDs photodetector and the optimal BLAuNA2/ZnO heterostructure photodetector at a bias voltage of 5 V and under intermittent 532 nm light illumination (37.9 mW/cm^2).

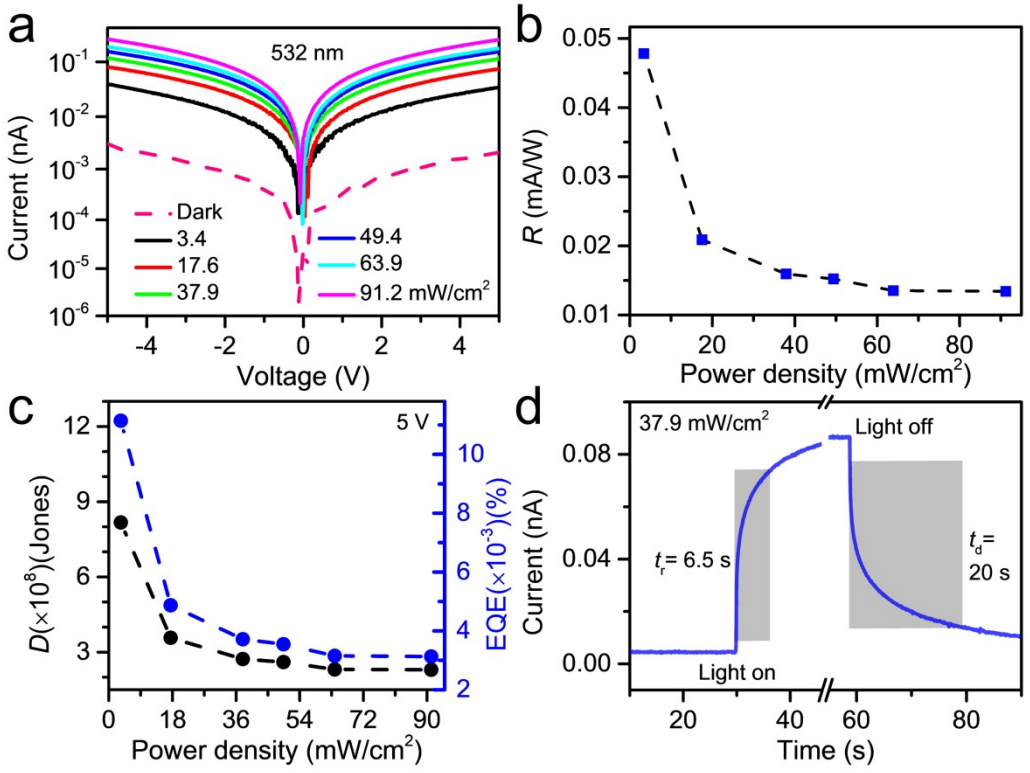

Figure S8. (a) *I*−*V* curves of the BLAuNA2/ZnO heterostructures photodetector in dark conditions and under 532 nm light illumination at different power densities. (b) *R* and (c) *D* and EQE versus light power density at a bias voltage of 5 V. (d) Rise/decay time of the photodetector measured at a power density of 37.9 mW/cm^2.

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