Electronic Supplementary information

(ESI)

Localized Surface Plasmon Resonance Enhanced Quantum Dot Light-emitting Diodes via QuantumDot-capped Gold Nanoparticles

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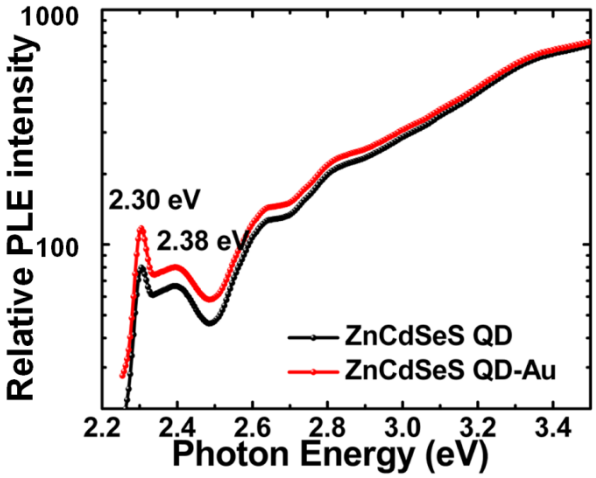

Figure S1.PL excitation (PLE) measurementswere carried out for the pristine QDs with emission peak and the QD capped AuNPs,respectively. The PLE intensity is increased for theQDs capped Au hybrids as the excitation energy decreases. The PLE is almost the same at the higher energy. It is obviously enhanced near the LSPR absorption peakof the Au NPs (2.38 eV) and QD emission peak (2.30 eV).

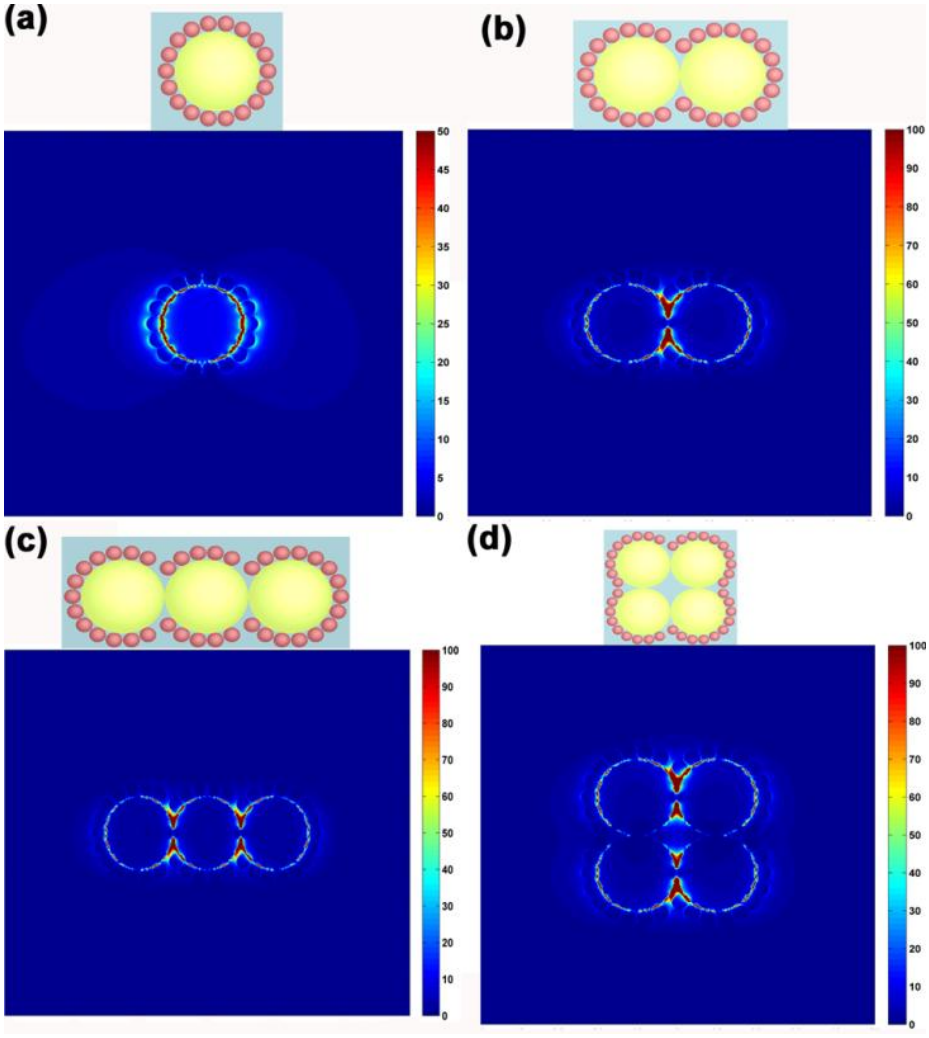

Figure S2. (a) Single (b) double, (c) triple and (d) quadruple QD-capped Au NPs. The magnitude of the enhancedelectric field intensity is indicated by color scale in a)-d).

To explore the electric field intensity enhancement caused by QD-capped Au NPs, we simulated the electric field intensity distribution using three-dimensional finite-differencetime-domain (FDTD) method. According to the TEM images, there are many possibilities regarding the number of QD-Au NPs that can be formed;accordingly, we performed thesimulation byvarying numbers of QD-Au NPs (from 1 to 4).Figure S2 (a)-(d) present the electricfield intensity distribution of single, double, triple, and quadruple QD-capped Au NPs, respectively. The bar is the electric field enhancementfold and the red color is observed to fill in the space of QD-Au and Au-Au.The electric field enhancement as high as 100 fold at the gap can be obtainedbetween the Au NPs and the surface of Au. Moreover, the electricfield enhancement for triple and quadruple Au NPs can be seen obviously.

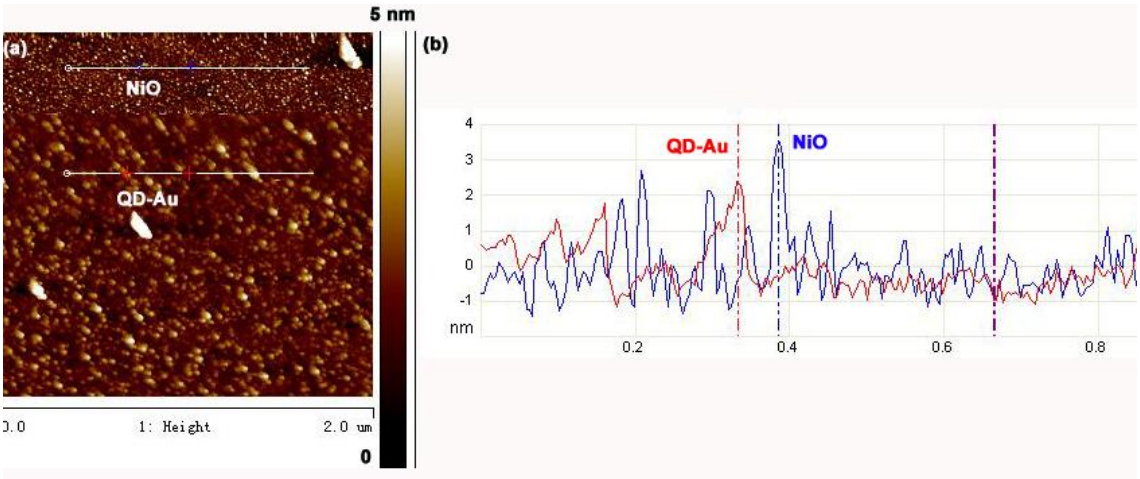

Figure S3. a) AFM scans of NiO and QD-Au films andb) surface line profile and root-mean square (RMS) roughness values for NiO and QD-Au films are shown.The average roughness for NiO and QD-Au is 3.5 nm and 2.5 nm, respectively.

Table S1.Triexponential fit parameters.

These values were used to estimate the average lifetime of QD and QD-capped Au NP emissiondecay using(1).

$$<\tau>=(\alpha_1\tau_1^2+\alpha_2\tau_2^2+\alpha_3\tau_3^2)/(\alpha_1\tau_1+\alpha_2\tau_2+\alpha_3\tau_3) \quad (1)$$

Film	α_1	τ_1(ns)	α_2	τ_2 (ns)	α_3	τ_3 (ns)	<τ>(ns)
NiO film	488.6268	0.34448	488.6268	0.34448	1017.788	2.36284	2.11
QD on NiO film	730.4406	3.30863	730.4406	3.30863	475.768	0.41452	3.20
QD-Au on NiO film	683.8991	0.32495	428.0589	2.44736	810.8288	2.44798	2.30

Table S2.The performance statistics of QD-LEDs under the same condition

Samples	Turn on voltage (V)	Maximum luminance(cd/m^2) (at the voltage)	Maximum power efficiency (lm/W)
SampleA-1	5.60	211 (11 V)	2.22 (5.6 V)
Sample A-2	5.70	205 (11 V)	2.10 (5.6 V)
Sample A-3	5.65	200 (11 V)	2.14 (5.6 V)
Sample A-4	5.60	200 (11 V)	2.14 (5.6 V)
Sample A-5	5.60	210 (11 V)	2.20 (5.6 V)
Sample B-1	2.60	1005 (10 V)	6.20 (5 V)
Sample B-2	2.65	940 (10 V)	6.12 (5 V)
Sample B-3	2.60	990 (10 V)	6.15 (5 V)
Sample B-4	2.62	1000 (10 V)	6.16 (5 V)
Sample B-5	2.60	1000 (10 V)	6.20 (5 V)