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Multifunctional Semiconducting Polymer Dots for Selective Recognition, Imaging, Detection, and Photo-Killing of Bacteria

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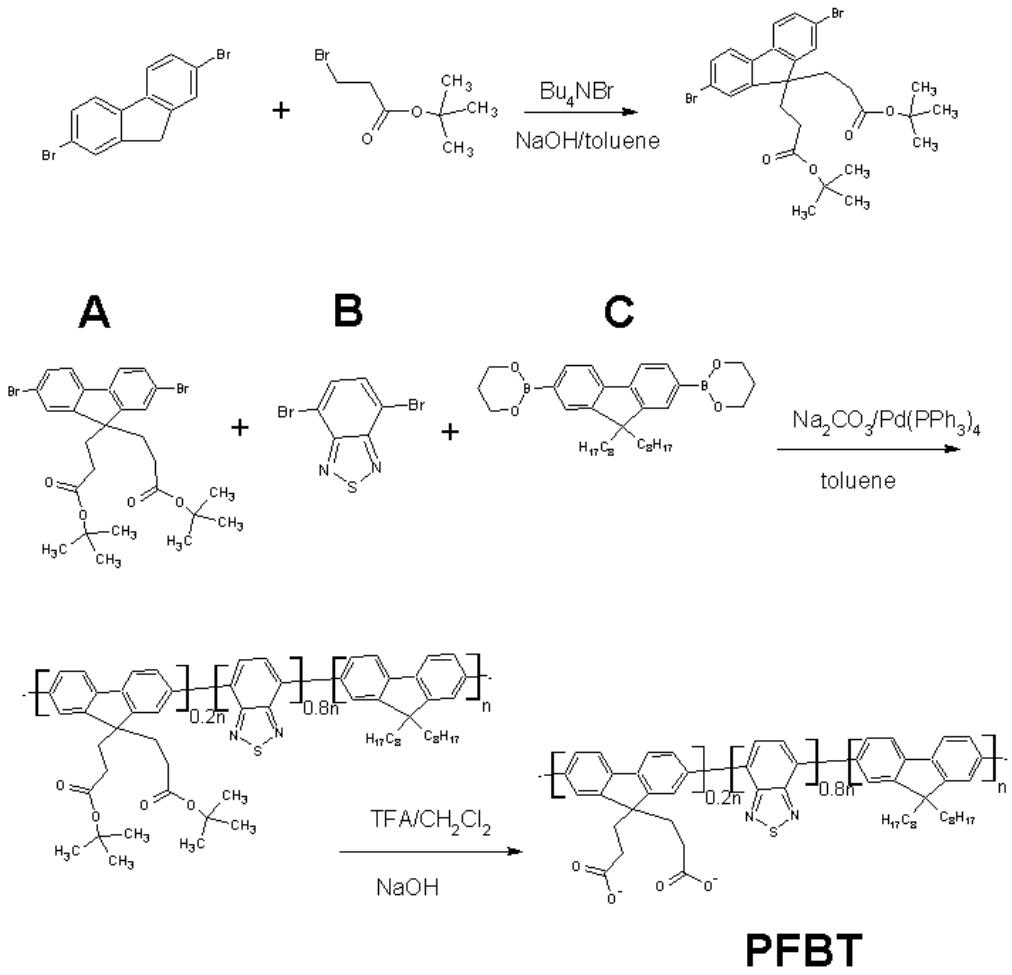


Figure S1 synthesis of functionalized PFBT.A mixture of 2,7-dibromo-9,9-bis(3-(tert-butyl propanoate))fluorine (monomer A, 0.232 g), 4,7-dibromobenzo[c][1,2,5]thiadiazole (monomer B, 0.176 g), and 9,9-dioctylfluorene-2,7-diboronic acid bis(1,3-propanediol) ester (monomer C, 0.56 g) were dissolved in 20 mL toluene, and then Bu_4NBr (12.5 mg) and 20 mL Na_2CO_3 (2 mol L-1) were added. The reaction system was degassed and refilled with argon after addition of $Pd(PPh_3)_4$ (50 mg). The mixture was stirred vigorously at 85 ^oC for 36 hours and phenylboronic acid (0.1 g) pre-dissolved in 1 mL tetrahydrofuran was added in 2 hours. Then 1 mL bromobenzene was rejected for further 3 hour. Methanol (100 mL) was poured into the mixture to form a yellow precipitate. The precipitate was filtered and washed with methanol, water and acetone, respectively. The resulting solid was dissolved in CH_2Cl_2 (10 mL), filtered using a 0.2 μm membrane. The filtrate liquor was concentrated and reprecipitated in methanol (30 mL). The power (364 mg, 62%) was collected by filtration, washed with methanol and dried in vacuo. The protecting group, tert-butyl esters, was removed by trifluoroacetic acid (TFA). TFA (2 mL) was added into a solution of polymer (100 mg) in CH_2Cl_2 (20 mL) at room temperature for 12 hours. The organic layer was washed with Mili-Q water and then stirred with NaOH (10%, 10 mL). The aqueous phase containing NaOH and PFBT was subjected to dialysis for 5 days and lyophilization to yield a water-soluble product of PFBT (297 mg, 83%).

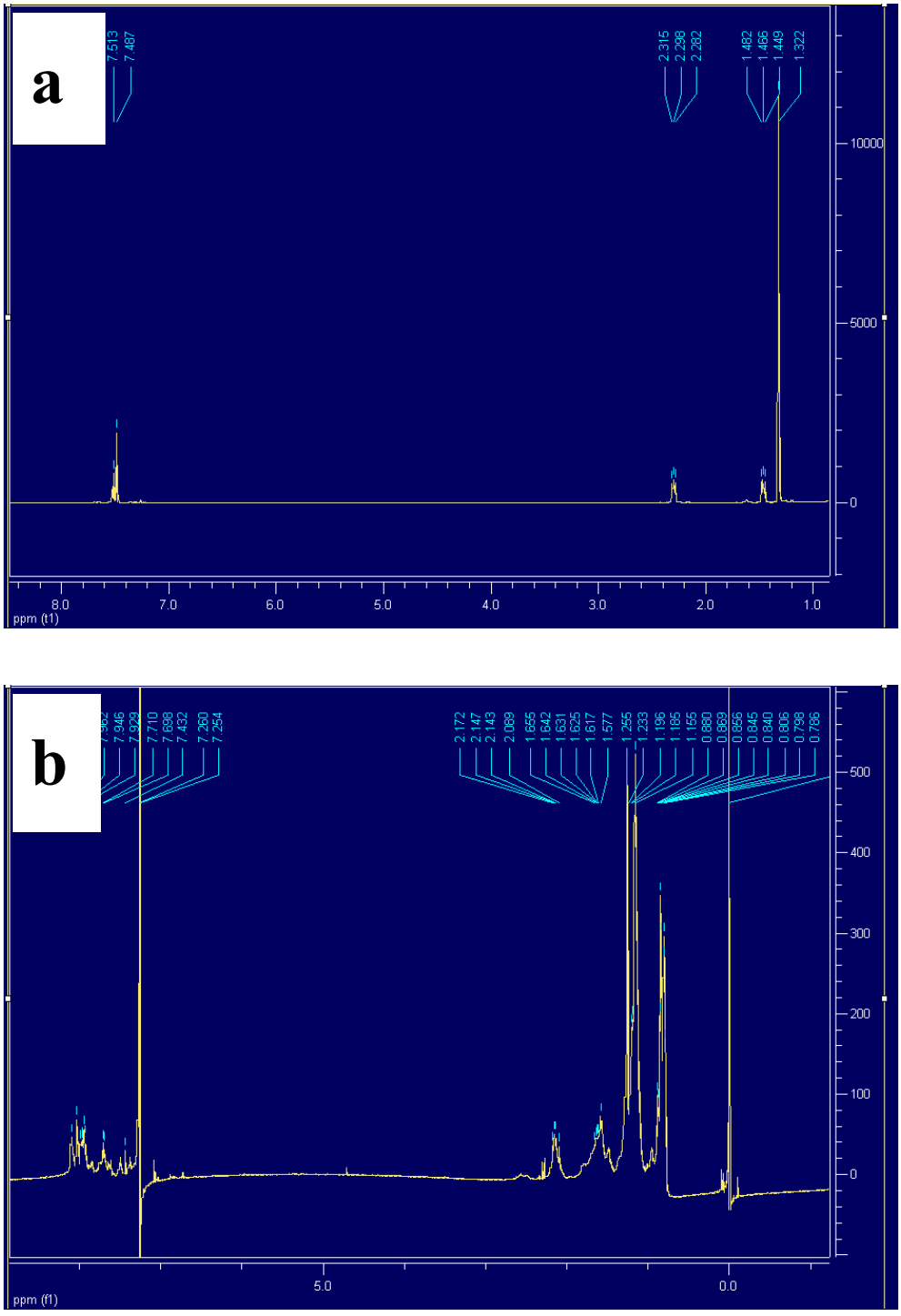


Figure S2 ^{1}H NMR data of 2.7-dibromo-9,9-bis(3-(tert-butyl propanoate)) fluorine (a) and polymer PFBT (b) measured in $CDCl_3$

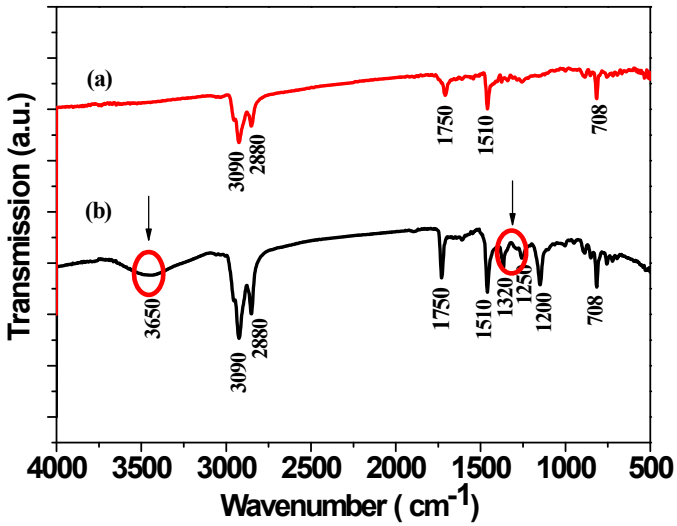


Figure S3 FI-IR spectra of PFBT polymer with (b) and without (a) side-chain carboxylic acid functional groups.

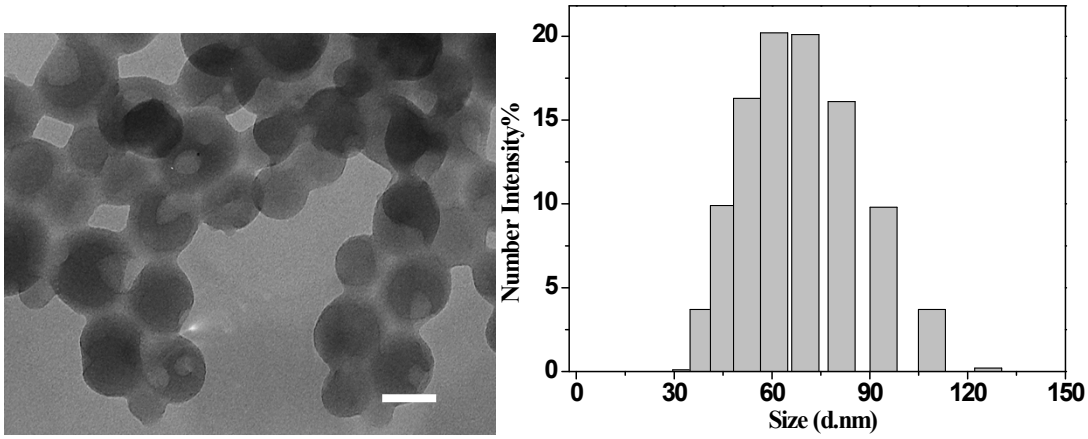


Figure S4 Transmission electron microscopy (left) and dynamic light scattering (right) measurements of PFBT dots. Scale bars is 50 nm.

Table S1. Analysis of All semiconducting Pdots in Water

	Pdots	Van-Pdots	PB-Pdots
DLS diameter (mean) (nm)	63.4±4.3	62.7±5.1	64.2±3.7
polydispersity index	1.92	1.88	1.83
excitation peak (nm)	486	491	487
emission peak (nm)	536	535	536
quantum yield (%)	14.4	13.7	12.4

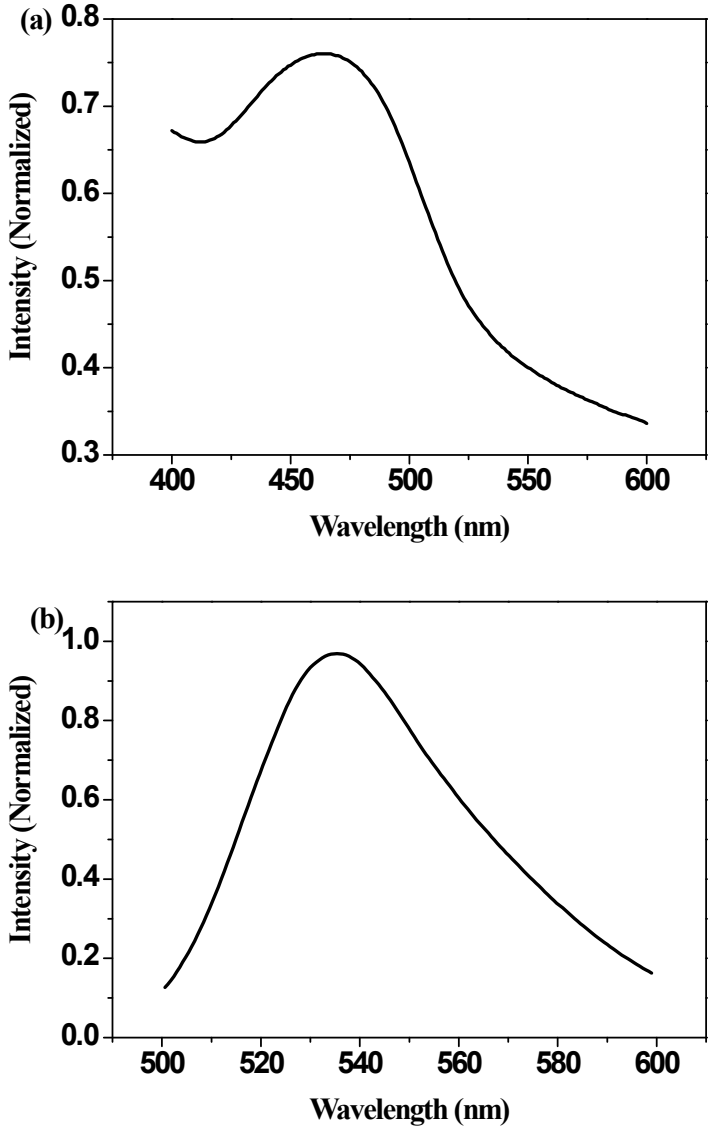
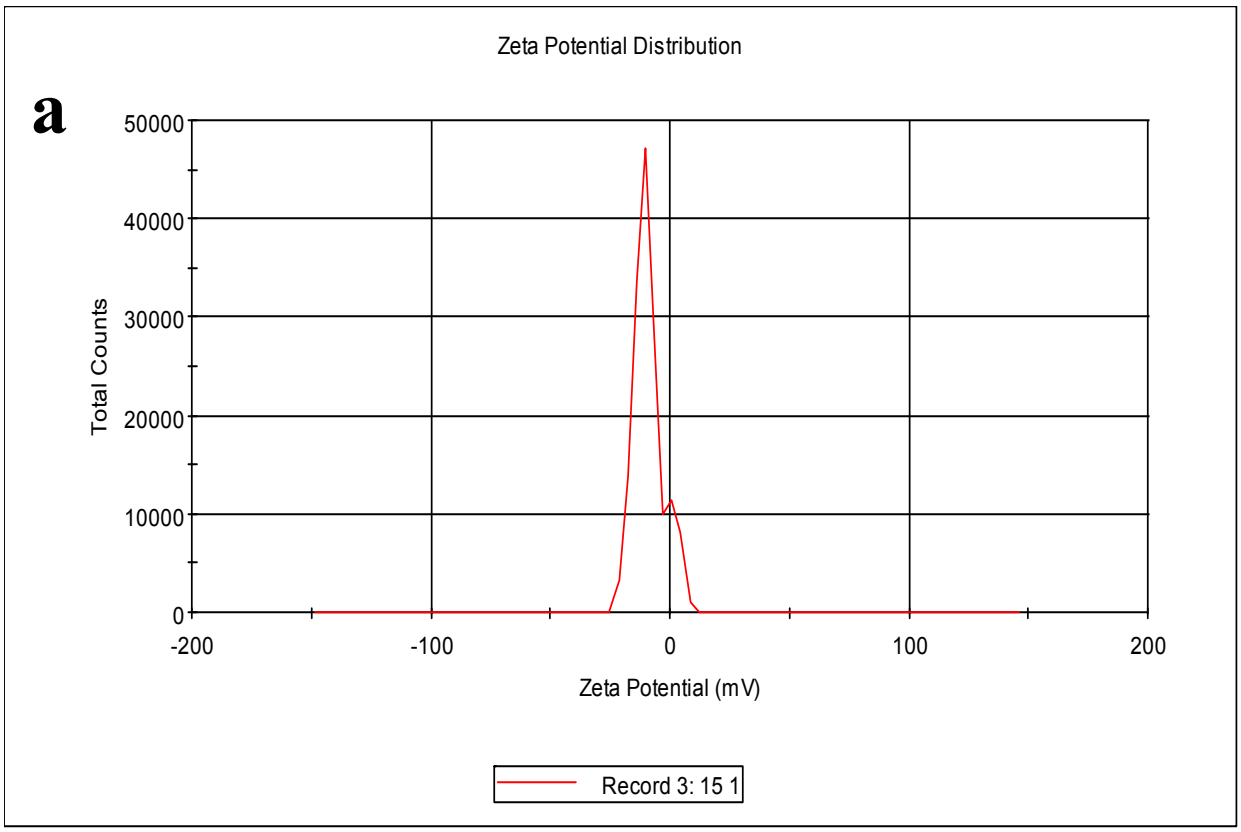


Figure S5 Absorption (a) and fluoresence (b) spectra of Pdots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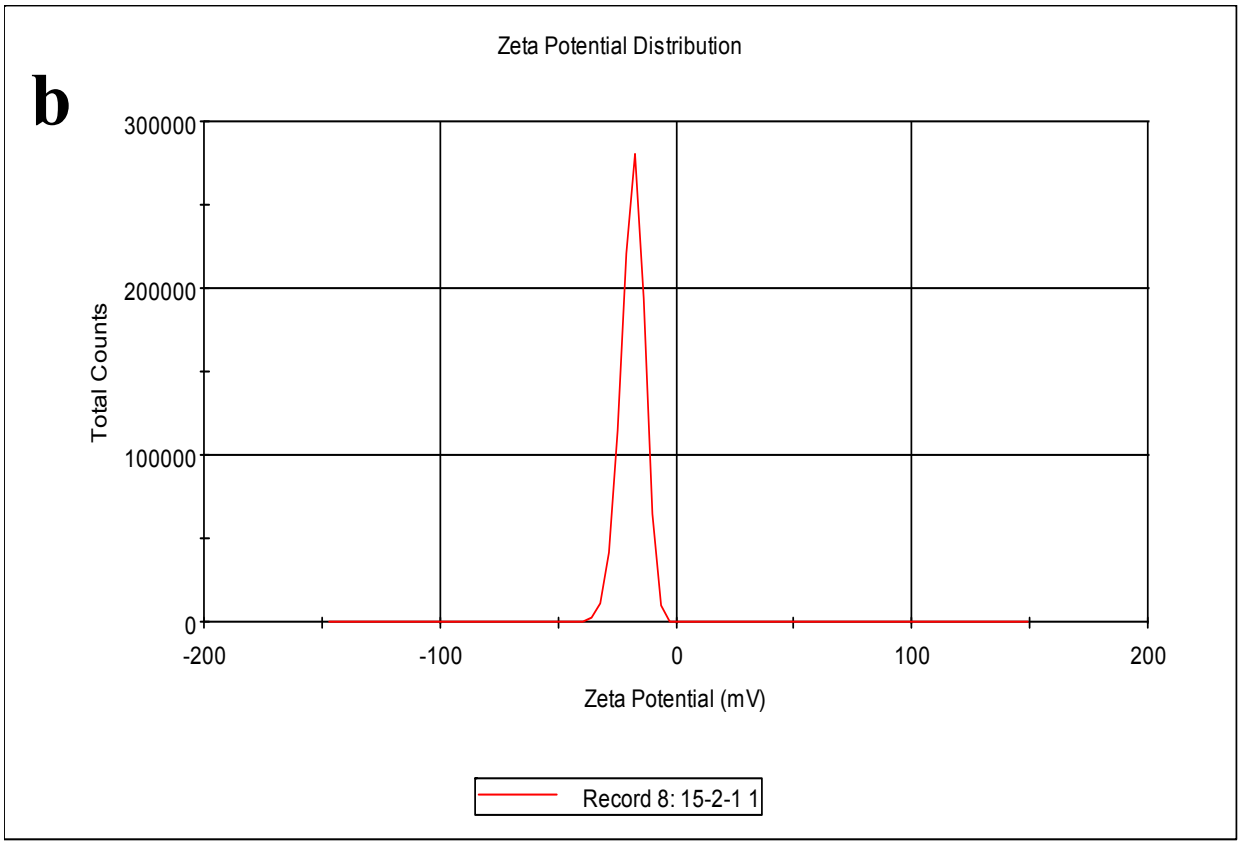
40000
30000
20000
10000
0
-200
-100
0
100
200
Zeta Potential (mV)
Record 3: 15 1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Zeta Potential Distribution
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200000
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-100
0
100
200
Zeta Potential (mV)
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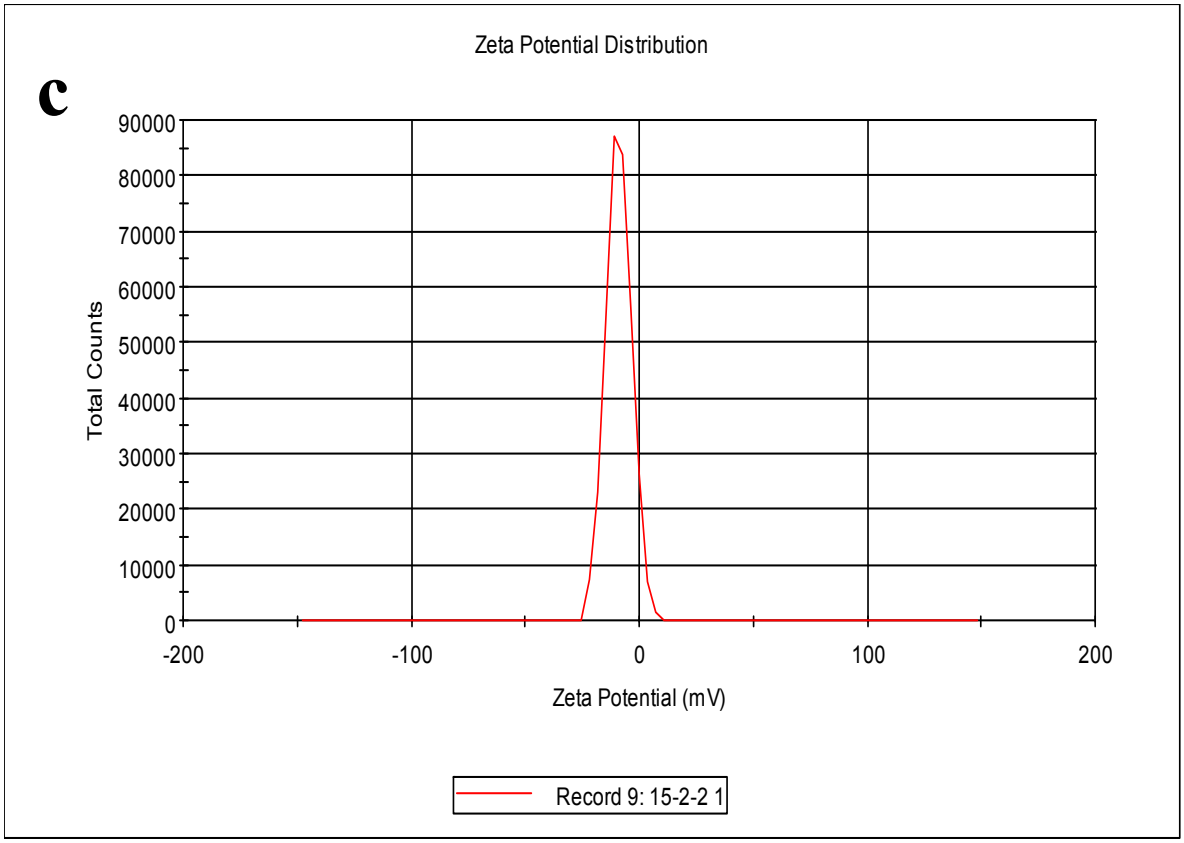

Figure S6 Zeta potential distribution of Pdots(a), Van-Pdots (b) and PB-Pdots (c).

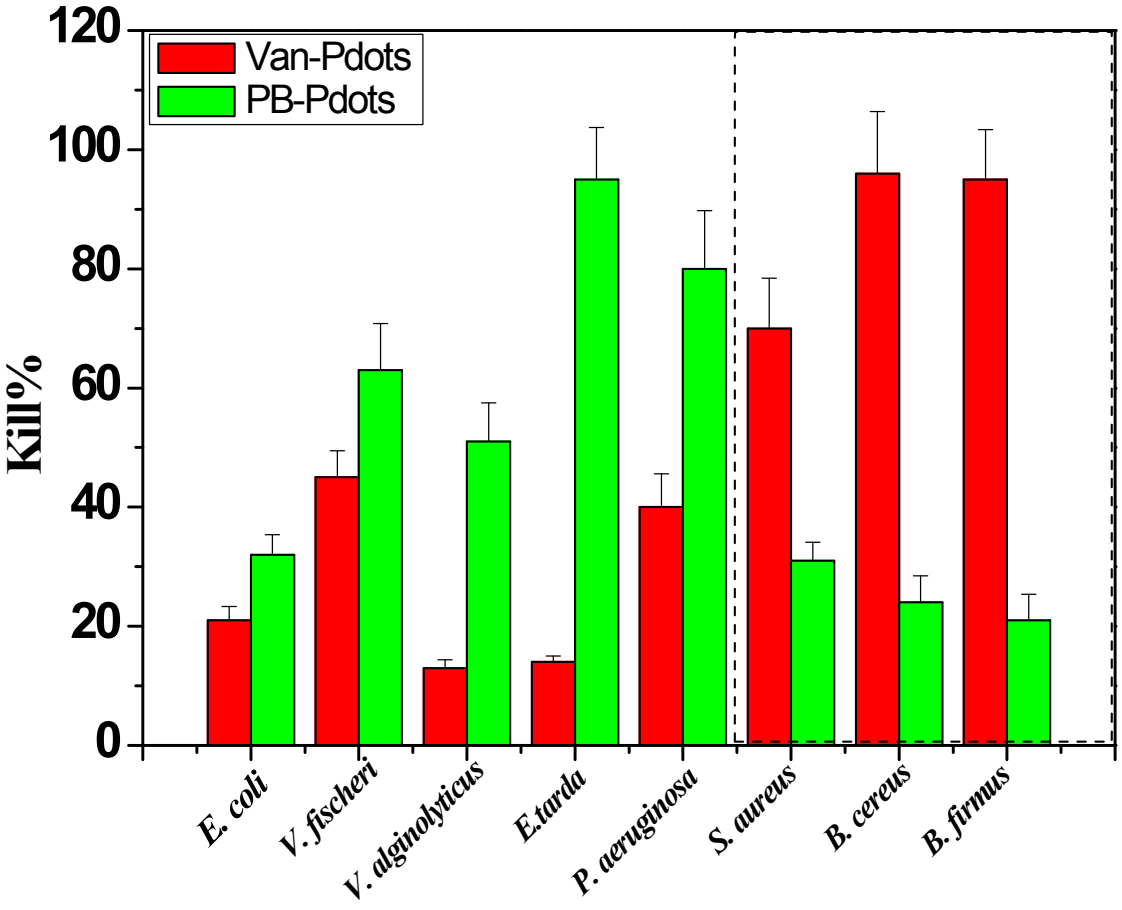

Figure S7 Photo-killing properties of eight different bacteia after incubation with 2.5 μmol L^{-1} of Van-Pdots (a) and PB-Pdots (b) under white light illumination for 1 hour.

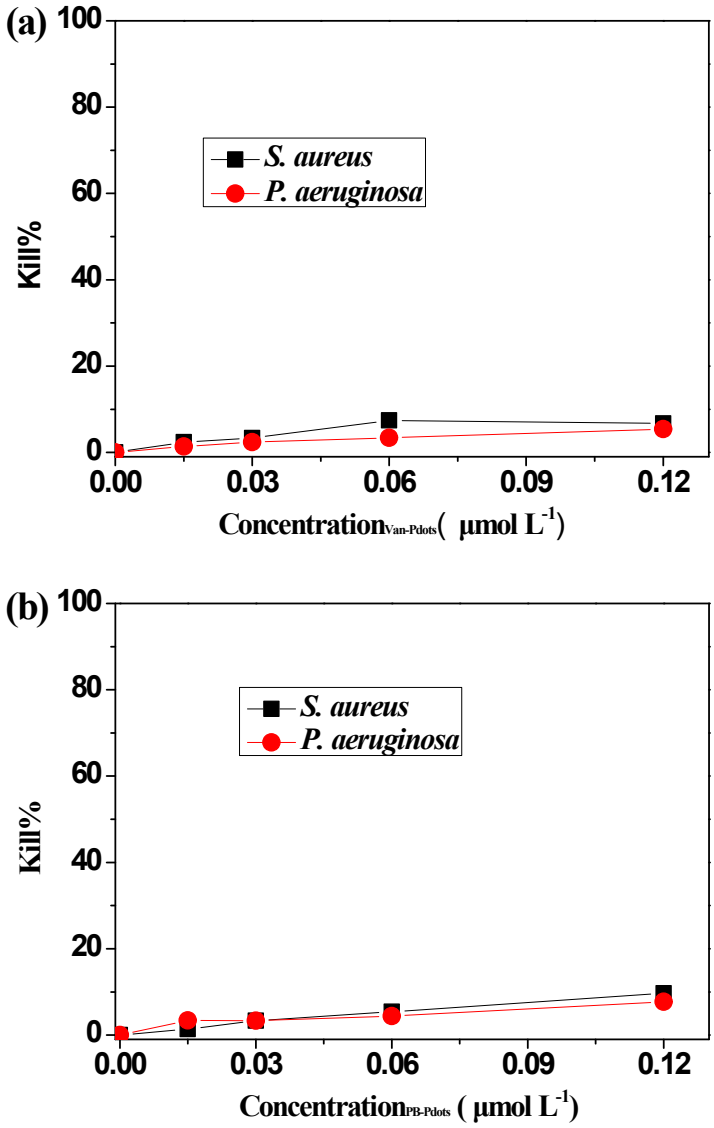

Figure S8 Photo-killing properties of *S. aureus* and *P. aeruginose* after incubation with a low concentration of Van-Pdots (a) and PB-Pdots (b) under white light illumination for 1 hour.

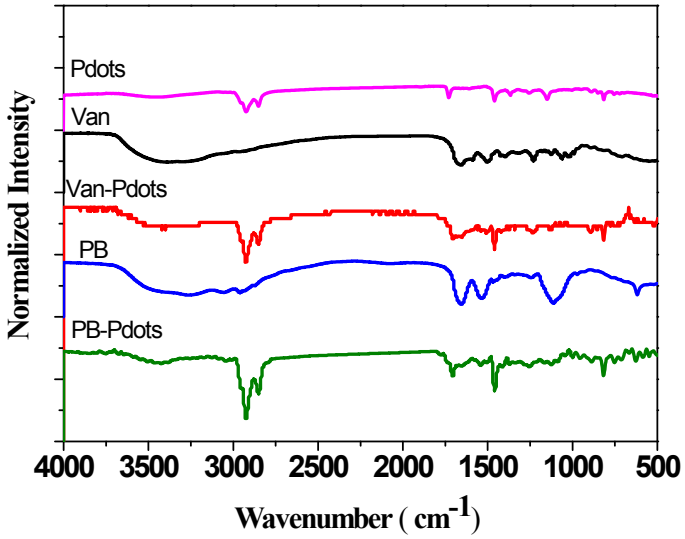

Figure S9 FT-IR spectra of antibiotic and antibiotic-functionalized Pdots.

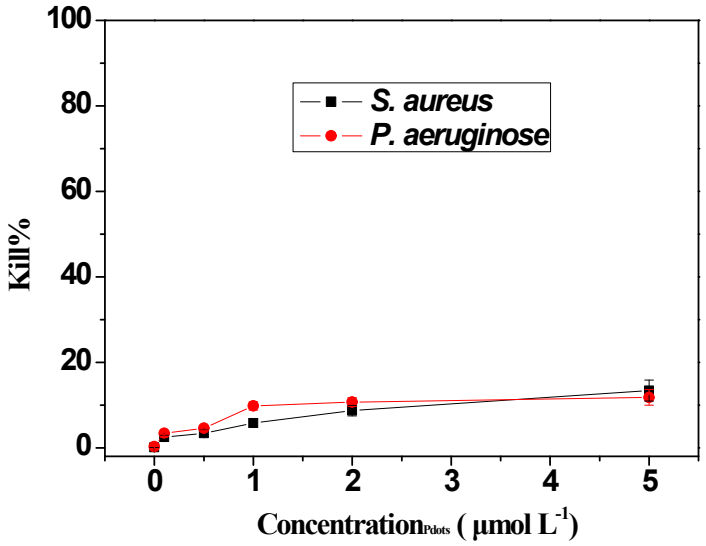

Figure S10 Photo-killing properties of *S. aureus* and *P. aeruginose* after incubation with a low concentration of Pdots under white light illumination for 1 hour.