Electronic Supplementary Information (ESI)

Preparation of hybrid silicon quantum dots by one-step synthesis for tetracycline detection and antibacterial applications

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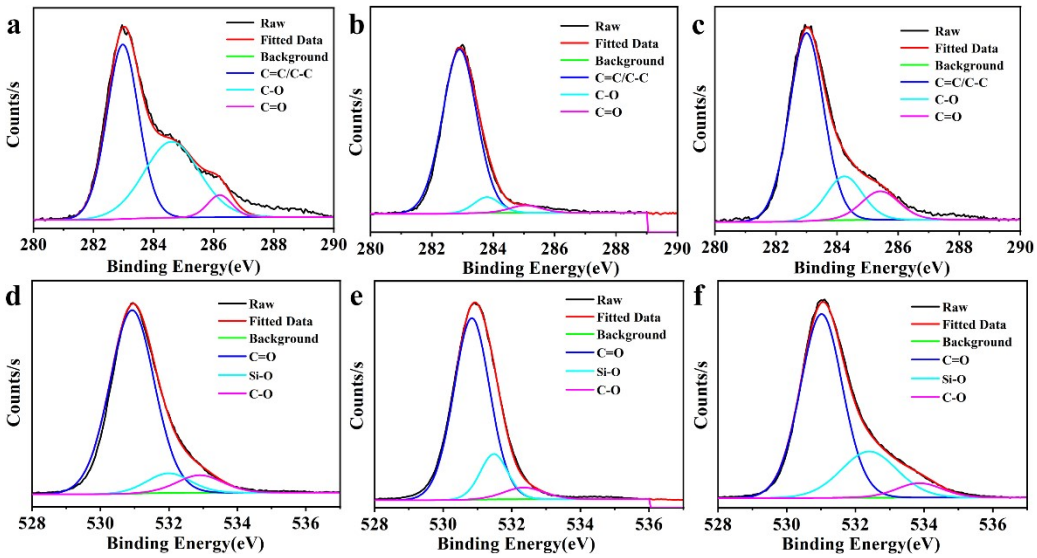

Fig. S1 The high-resolution C 1s (a–c), O 1s (d–f) XPS spectra of SiQDs-1 (a, c), SiQDs-2 (b, e) and SiQDs-3 (c, f).

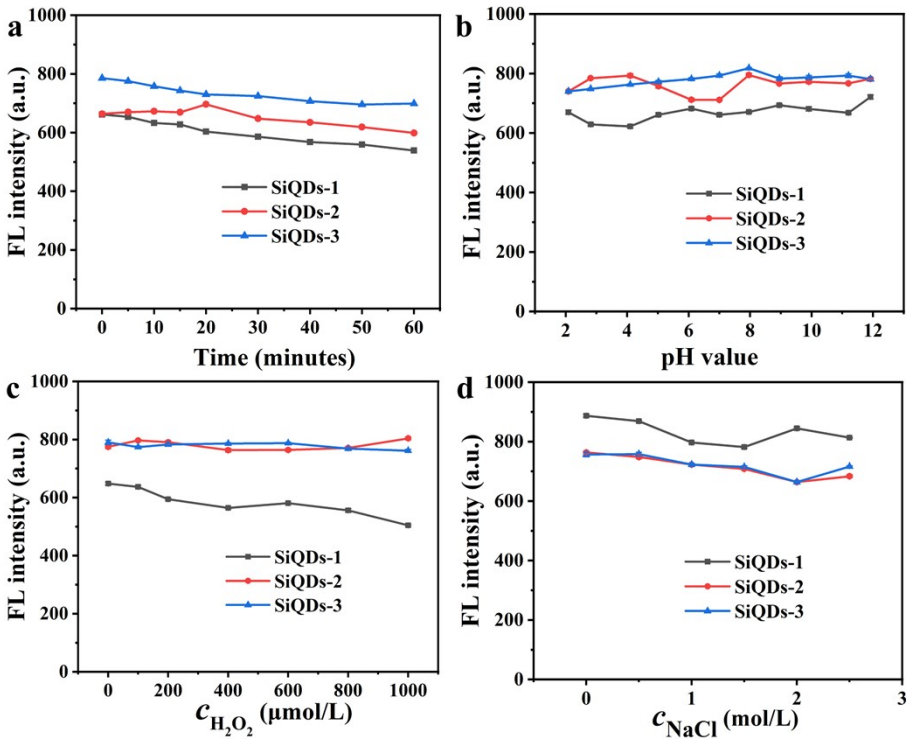

Fig. S2 Fluorescent spectra of SiQDs in different incubation time (a), different concentration of pH solutions (b) and H_2O_2 (c), NaCl (d).

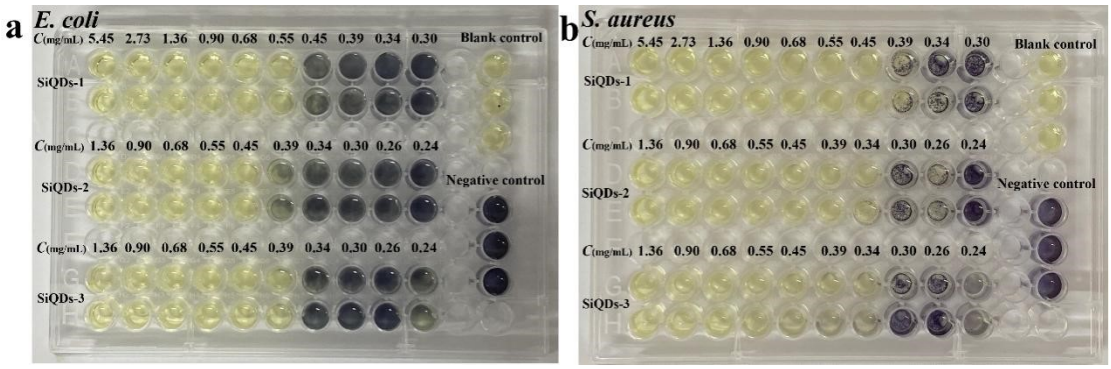

Fig. S3 The antibacterial ability of SiQDs-1, SiQDs-2 and SiQDs-3 on *E. coli* (a) and *S. aureus* (b).

Table S1. OD values of *E. coli* treated with different concentrations of SiQDs-1, SiQDs-2, SiQDs-3 in Fig. S3.

C_{SiQDs} (mg/mL)	5.45	2.73	1.36	0.90	0.68	0.55	0.45	0.39	0.34	0.30	0.26	0.24	Blank group
													0.059
	0.044	0.049	0.046	0.048	0.049	0.054	0.194	0.303	0.411	0.473			0.055
SiQDs-1	0.038	0.045	0.043	0.045	0.048	0.065	0.148	0.265	0.349	0.422			0.064
			0.042	0.048	0.046	0.048	0.061	0.164	0.279	0.345	0.352	0.459	**Negative group**
SiQDs-2			0.037	0.043	0.041	0.044	0.058	0.136	0.243	0.352	0.307	0.43	0.663
			0.033	0.042	0.037	0.041	0.051	0.072	0.22	0.404	0.491	0.24	0.651
SiQDs-3			0.061	0.062	0.067	0.076	0.078	0.088	0.265	0.3	0.439	0.164	0.656

Table S2. OD values of *S. aureus* treated with different concentrations of SiQDs-1, SiQDs-2, SiQDs-3 in Fig. S3.

C_{SiQDs} (mg/mL)	5.45	2.73	1.36	0.90	0.68	0.55	0.45	0.39	0.34	0.30	0.26	0.24	Blank group
													0.053
	0.047	0.044	0.048	0.047	0.053	0.055	0.058	0.148	0.239	0.366			0.06
SiQDs-1	0.041	0.038	0.048	0.049	0.054	0.058	0.064	0.175	0.197	0.28			0.053
			0.044	0.049	0.056	0.059	0.058	0.065	0.076	0.221	0.13	0.513	**Negative group**
SiQDs-2			0.046	0.043	0.052	0.055	0.059	0.065	0.08	0.269	0.142	0.519	0.505
			0.036	0.039	0.047	0.053	0.068	0.076	0.073	0.332	0.238	0.193	0.497
SiQDs-3			0.045	0.053	0.057	0.061	0.069	0.071	0.087	0.34	0.527	0.21	0.5

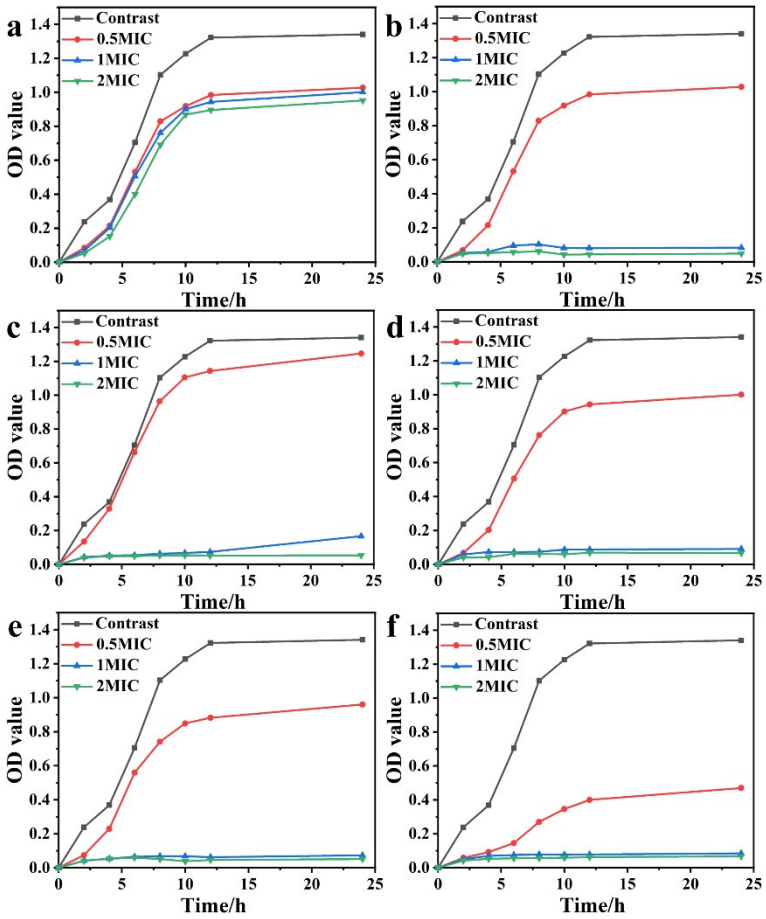

Fig. S4 Antibacterial activities of SiQDs-1(a, b), SiQDs-2 (c, d), SiQDs-3 (e, f) against *E. coli* (a)(c)(e) and *S. aureus* (b)(d)(f).

Table S3. Comparison of the reported fluorescence probes with SiQDs-3 for TC detection

Probes	Detection range (μM)	LOD (μM)	Ref.
CDs	10-400	6.0	1
waste printing paper	1-100	0.48	2
CRSSs-NH2@N-CDs	0.5-60	0.39	3
UiO-66-NH_2	0-37500	0.449	4
N-CQDs	0-30	0.344	5

RBP-CDs	0.5-30	0.36	6
ZnO NRs	2-120	1.27	7
Cu-NCDs	1-80	0.416	8
SiQDs-3	0-1.2	0.318	This work

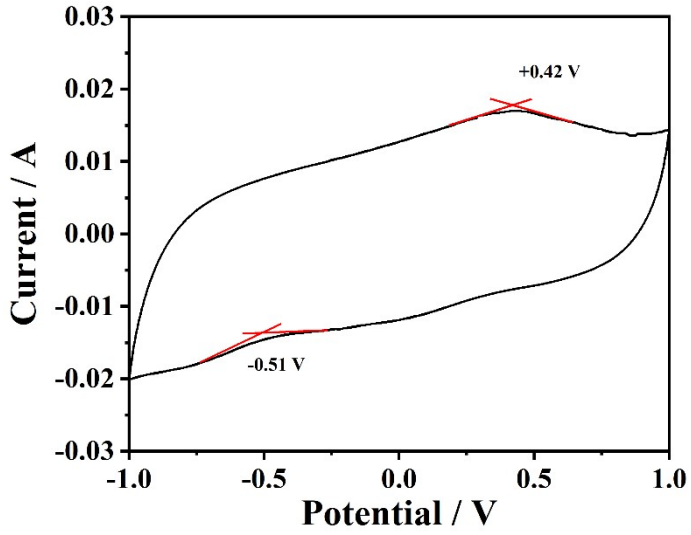

Fig. S5. Cyclic voltammograms of the SiQDs-3 in the solution state.

The HOMO and LUMO energy levels of SiQDs-3 could be estimated according to the empirical formula:

$E_{HUMO} = - e (E_{ox} + 4.4)$

$E_{LUMO} = - e (E_{red} + 4.4)$

Where E_{ox} and E_{red} are the onset of oxidation and reduction potential for SiQDs-3, respectively. The E_{ox} and E_{red} are determined to be 0.42 V and -0.51 V. The corresponding E_{HUMO} and E_{LUMO} were calculated to be -4.82 eV and -3.89 eV.

Reference

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