Supporting information

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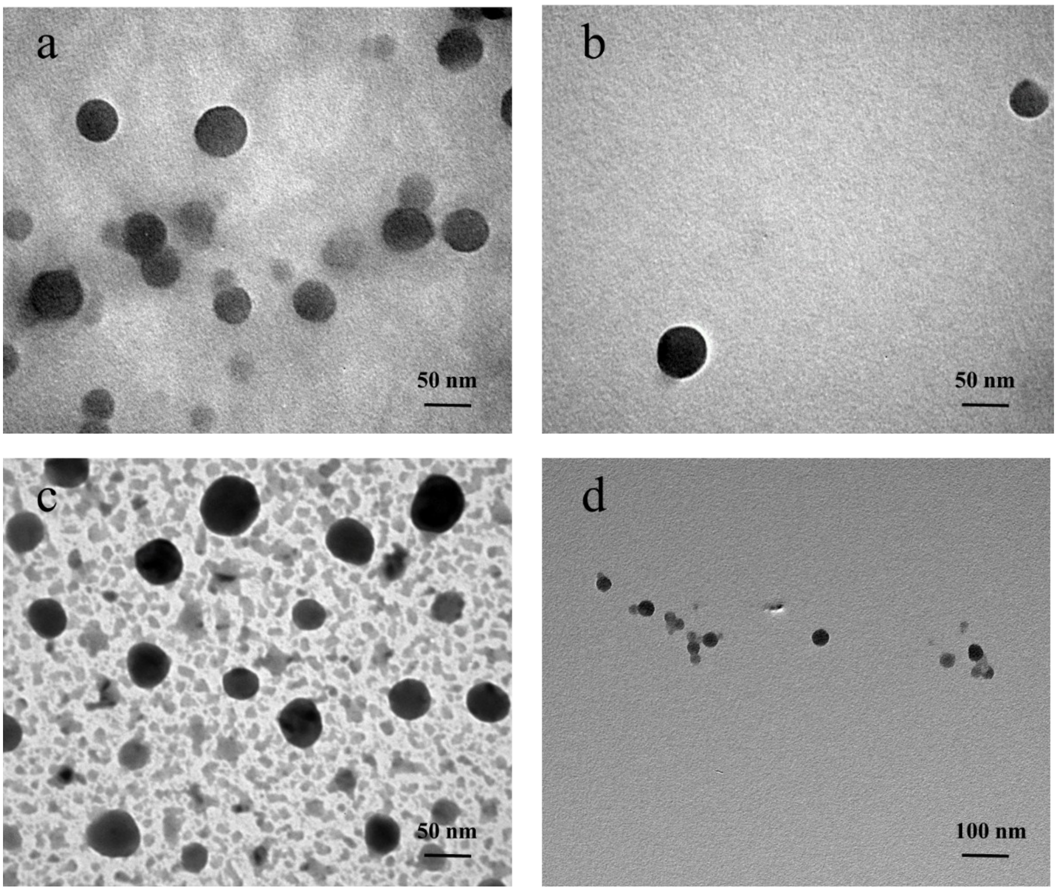

Fig. S1. TEM images of Pdots-MG (a), Pdots-NPG (b), Pdots-DG (c) and Pdots (d).

Table S1. Zeta potential values of different Pdots.

	Pdots-MG	Pdots-NPG	Pdots-DG	Pdots
Zeta Potential	-0.097	-0.006	-0.227	0.102

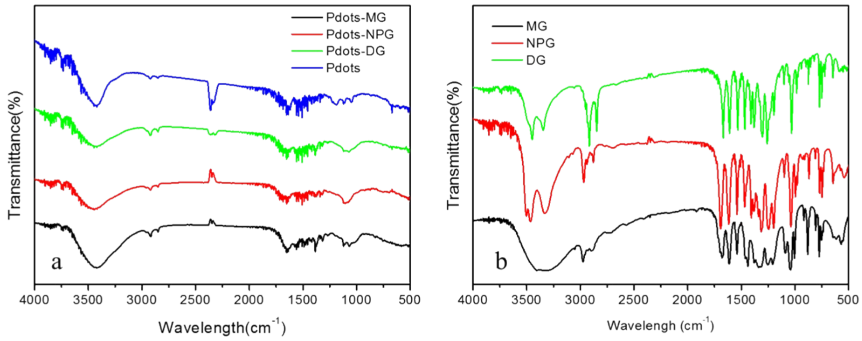

Fig. S2. FTIR spectra of four kinds of polymer dots(a) and three kinds of gallates.

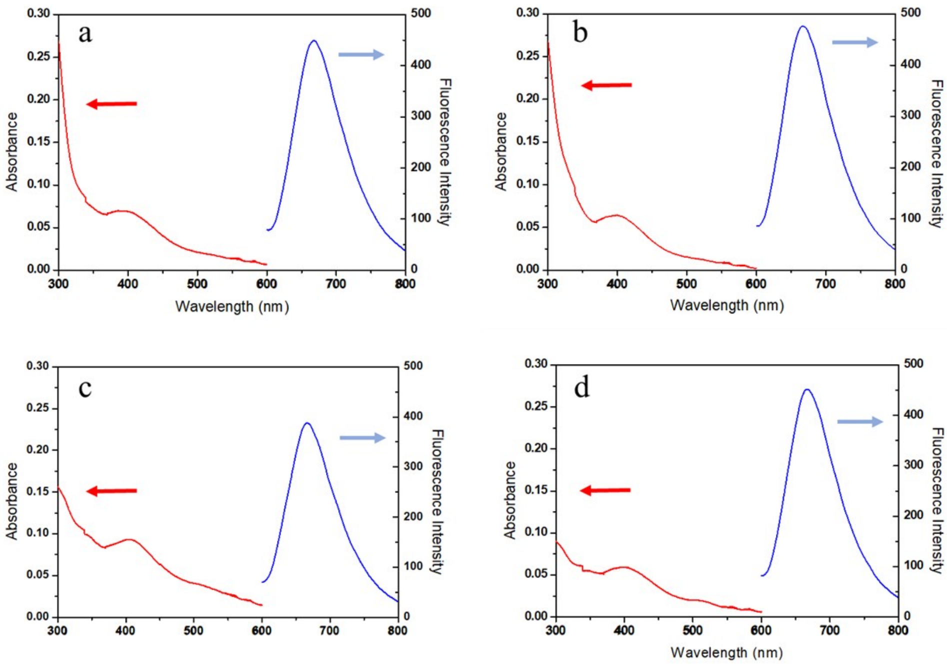

Fig. S3. UV-vis spectra and fluorescence spectra of Pdots-MG (a), Pdots-NPG (b), Pdots-DG (c) and Pdots (d).

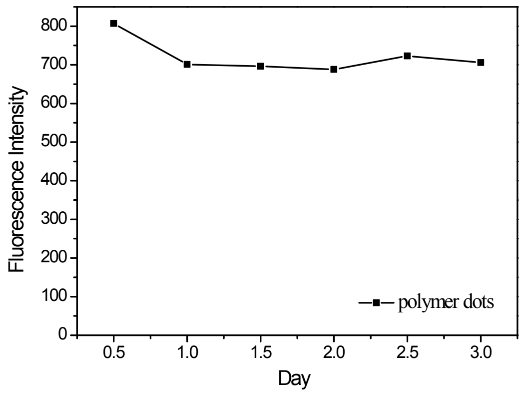

Fig. S4. Stability test of the polymer dots.

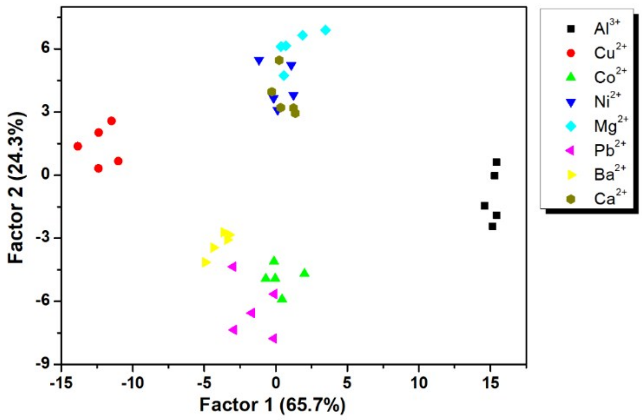

Fig. S5. Canonical score plot for the response patterns as obtained from LDA for eight metal ions at pH 7.0 at 0.5 μg/mL.

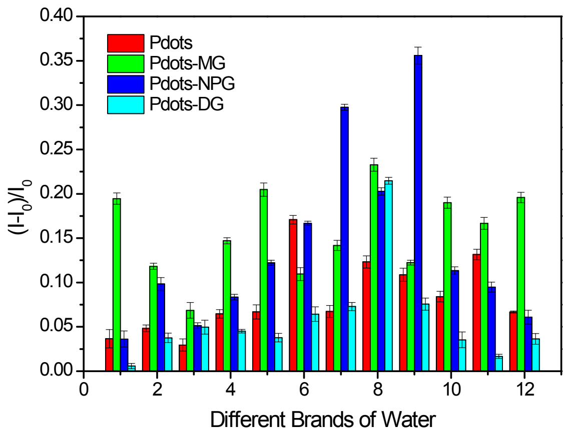

Fig. S6. Fluorescence responses of the as-developed sensor array to 12 different brands of packaged water, in which I and I_0 represent the fluorescence intensities of the polymer dots in the presence and absence of bottled water samples, respectively.

Table S2. List of the twelve bottled water samples used in this study.

No.	Brand
1	Ganten
2	Wahaha Mineral Water
3	Quan Yangquan
4	San Benedetto
5	Alkaqua
6	Evian
7	Kunlun Mountain Mineral Water
8	Hanyang Spring
9	Icedew Chunyue
10	Icedew
11	Nongfu Spring
12	Gesang Spring

Table S3. Identification of 24 blind samples

Sample	Identification	Verification	Sample	Identification	Identification
1	Gesang Spring	Gesang Spring	13	Nongfu Spring	Nongfu Spring
2	Gesang Spring	Gesang Spring	14	Nongfu Spring	Nongfu Spring
3	San Benedetto	San Benedetto	15	Wahaha Mineral Water	Wahaha Mineral Water

4	San Benedetto	San Benedetto	16	Wahaha Mineral Water	Wahaha Mineral Water
5	Icedew Chunyue	Icedew Chunyue	17	Quan Yangquan	Quan Yangquan
6	Icedew Chunyue	Icedew Chunyue	18	Quan Yangquan	Quan Yangquan
7	Icedew	Icedew	19	Kunlun mountain mineral water	Kunlun mountain mineral water
8	Icedew	Icedew	20	Kunlun mountain mineral water	Kunlun mountain mineral water
9	Evian	Evian	21	Hanyang Spring	Hanyang Spring
10	Evian	Evian	22	Hanyang Spring	Hanyang Spring
11	Ganten	Ganten	23	Alkaqua	Alkaqua
12	Ganten	Ganten	24	Alkaqua	Alkaqua
100% identified					

Table S4. Training matrix of response patterns by four sensing elements against eight metal ions at **1 μM**

Metal Ions	Pdots-MG	Pdots-NPG	Pdots-DG	Pdots
Al^{3+}	0.1137756	0.1070418	0.333155822	0.22851216
Al^{3+}	0.1061547	0.0899816	0.315789183	0.23006083
Al^{3+}	0.1047396	0.0892212	0.332041091	0.22263593
Al^{3+}	0.1011285	0.0779732	0.314837246	0.22816098
Al^{3+}	0.1004091	0.1003944	0.318071072	0.22920143
Cu^{2+}	-0.077356	-0.134846	-0.01998945	-0.0351675
Cu^{2+}	-0.087024	-0.125707	-0.01729496	-0.0369175
Cu^{2+}	-0.091891	-0.124926	-0.01914899	-0.043897
Cu^{2+}	-0.093982	-0.139343	-0.03186472	-0.053791
Cu^{2+}	-0.074502	-0.130508	-0.02485906	-0.0410642
Co^{2+}	-0.011728	-0.00923	-0.00833475	-0.0009804
Co^{2+}	-0.02361	-0.012169	-0.00149663	-0.0012833
Co^{2+}	-0.016173	-0.012564	-0.01677003	-0.0046216
Co^{2+}	-0.026165	-0.016791	-0.01329931	-0.0090385
Co^{2+}	-0.031505	-0.019243	-0.02035523	-0.0049368
Ni^{2+}	0.001558	0.0452788	0.002507406	0.01893052
Ni^{2+}	-0.005022	0.0240678	-0.01037307	0.00889729
Ni^{2+}	-0.00501	0.0359862	-0.01726983	0.01383408
Ni^{2+}	-0.003964	0.0315857	-0.0075306	0.01806474
Ni^{2+}	0.0048	0.0303149	-0.00963034	0.00824846
Mg^{2+}	0.0349011	0.1357749	0.141427464	0.13409545
Mg^{2+}	0.0225312	0.1237738	0.135329549	0.12734673
Mg^{2+}	0.03366	0.1315991	0.12946617	0.11651693
Mg^{2+}	0.0379433	0.1385241	0.142059329	0.1267229
Mg^{2+}	0.0405018	0.1313288	0.147539174	0.12803818
Pb^{2+}	-0.037199	-0.131627	0.032688425	-0.011161
Pb^{2+}	-0.033217	-0.139989	0.029382446	-0.0001494
Pb^{2+}	-0.050516	-0.135253	0.024026984	-0.0247249
Pb^{2+}	-0.039577	-0.139393	0.031353748	-0.0187443
Pb^{2+}	-0.044851	-0.138959	0.028589458	-0.0067912
Ba^{2+}	0.0345025	0.0821442	0.148402816	0.08405587
Ba^{2+}	0.0360662	0.0847051	0.150974425	0.07636049
Ba^{2+}	0.0443177	0.0771815	0.141860664	0.07982864
Ba^{2+}	0.0401647	0.0650525	0.143908018	0.07326969
Ba^{2+}	0.0476878	0.0804449	0.146551367	0.08300669
Ca^{2+}	0.0492551	0.1366076	0.069353428	0.12526147
Ca^{2+}	0.0388873	0.1394945	0.065912659	0.11853674
Ca^{2+}	0.0452707	0.1249276	0.061782081	0.1175661
Ca^{2+}	0.039266	0.1310971	0.062242874	0.11509694
Ca^{2+}	0.0230023	0.1415099	0.071886408	0.12464855

Table S5. Training matrix of response patterns by four sensing elements against eight metal ions at **10 μM**

Metal Ions	Pdots-MG	Pdots-NPG	Pdots-DG	Pdots
Al^{3+}	0.0657644	0.0543405	0.209843106	0.07916271
Al^{3+}	0.0551659	0.0529754	0.21021447	0.08061796
Al^{3+}	0.0501438	0.0431046	0.213333371	0.08290624
Al^{3+}	0.0515043	0.0419703	0.216633765	0.08080217
Al^{3+}	0.0517123	0.0326554	0.222871567	0.07779752
Cu^{2+}	-0.116564	-0.012643	0.181694817	-0.0103321
Cu^{2+}	-0.120664	-0.016205	0.175032599	-0.0153773
Cu^{2+}	-0.120553	-0.022536	0.177799681	-0.0081052
Cu^{2+}	-0.124615	-0.015028	0.181664102	-0.0090938
Cu^{2+}	-0.123179	-0.009848	0.169129863	-0.0102052
Co^{2+}	0.0483672	-0.039004	0.024328543	0.04638173
Co^{2+}	0.0256612	-0.054336	0.024811595	0.04612998
Co^{2+}	0.0325001	-0.043085	0.026618157	0.04922469
Co^{2+}	0.0269727	-0.0544	0.034235311	0.04558144
Co^{2+}	0.013503	-0.056594	0.022234384	0.04285106
Ni^{2+}	-0.005147	0.0536523	0.017385215	-0.0082026
Ni^{2+}	-0.006202	0.0377157	0.02801674	0.00233429
Ni^{2+}	-0.006466	0.0505721	0.02760709	0.00095259
Ni^{2+}	-0.024601	0.0478811	0.024495964	0.00494492
Ni^{2+}	0.0003525	0.0432858	0.02649716	0.00284653
Mg^{2+}	-0.018687	0.1087051	0.044798552	0.00630416
Mg^{2+}	-0.01635	0.116735	0.047807265	-0.0065378
Mg^{2+}	-0.018445	0.1096346	0.034535158	-0.0034284
Mg^{2+}	-0.022065	0.1154511	0.035661696	0.00458321
Mg^{2+}	-0.018753	0.1116426	0.047037787	0.00420127
Pb^{2+}	-0.187586	0.0287438	0.122421741	0.06667335
Pb^{2+}	-0.201395	0.0311886	0.120816219	0.0612658
Pb^{2+}	-0.195163	0.0353136	0.115547315	0.06549851
Pb^{2+}	-0.199876	0.019831	0.106053795	0.06022604
Pb^{2+}	-0.18689	0.0288183	0.106182237	0.06722393
Ba^{2+}	0.1012144	-0.071451	0.081725252	0.06304853
Ba^{2+}	0.1044511	-0.079299	0.077020375	0.06024242
Ba^{2+}	0.0962256	-0.081292	0.076637842	0.05496791
Ba^{2+}	0.1054723	-0.07954	0.074814527	0.0614541
Ba^{2+}	0.0866133	-0.08467	0.073566409	0.05555737
Ca^{2+}	0.0986155	0.0555219	0.041410635	-0.0236058
Ca^{2+}	0.0878579	0.0332825	0.031354834	-0.0242191
Ca^{2+}	0.0923179	0.0296944	0.043680318	-0.0287686
Ca^{2+}	0.0917859	0.0496384	0.025428749	-0.0269803
Ca^{2+}	0.083234	0.0422785	0.037734857	-0.0300133

Table S6. Training matrix of response patterns by four sensing elements against eight metal ions at **25 μM**

Metal Ions	Pdots-MG	Pdots-NPG	Pdots-DG	Pdots
Al^{3+}	0.0292402	0.0231221	-0.00832026	0.03721068
Al^{3+}	0.0278894	0.034629	-0.00761616	0.01509069
Al^{3+}	0.038134	0.0349536	-0.01021646	0.0087386
Al^{3+}	0.0162225	0.0233003	-0.01416222	0.00253953
Al^{3+}	0.0245263	0.0264698	-0.00828192	0.01163302
Cu^{2+}	-0.311187	-0.354952	-0.26893931	-0.2946185
Cu^{2+}	-0.302423	-0.354074	-0.27022901	-0.2986166
Cu^{2+}	-0.312292	-0.358265	-0.27448499	-0.294485
Cu^{2+}	-0.304957	-0.369196	-0.27080763	-0.2936124
Cu^{2+}	-0.310898	-0.360018	-0.26757642	-0.2911608
Co^{2+}	-0.094897	-0.11401	-0.26321238	-0.1284711
Co^{2+}	-0.103033	-0.127897	-0.25348043	-0.1306655
Co^{2+}	-0.09804	-0.120747	-0.25755865	-0.1384567
Co^{2+}	-0.095497	-0.134137	-0.26821778	-0.1291516
Co^{2+}	-0.102459	-0.135939	-0.2645195	-0.1256841
Ni^{2+}	0.0415255	-0.006594	0.101512338	0.06819396
Ni^{2+}	0.0583908	-0.001627	0.112000199	0.05395926
Ni^{2+}	0.0557273	-0.011909	0.090329149	0.05307804
Ni^{2+}	0.0531036	0.0006372	0.097348649	0.0505151
Ni^{2+}	0.052406	-0.003162	0.095469608	0.0518631
Mg^{2+}	-0.046304	-0.026237	-0.33260483	-0.0811837
Mg^{2+}	-0.052024	-0.036605	-0.33012304	-0.0752451
Mg^{2+}	-0.062508	-0.033127	-0.33505525	-0.0858623
Mg^{2+}	-0.063545	-0.027727	-0.3307644	-0.0887567
Mg^{2+}	-0.063185	-0.034798	-0.3425285	-0.0849474
Pb^{2+}	-0.277919	-0.236822	-0.03461257	-0.114419
Pb^{2+}	-0.275658	-0.238826	-0.04098435	-0.119586
Pb^{2+}	-0.278819	-0.244048	-0.04043362	-0.1275334
Pb^{2+}	-0.275593	-0.24655	-0.03699327	-0.1155748
Pb^{2+}	-0.284055	-0.250928	-0.02863815	-0.1186451
Ba^{2+}	-0.045789	-0.064462	-0.17697027	-0.0554758
Ba^{2+}	-0.05141	-0.056844	-0.18227195	-0.0532553
Ba^{2+}	-0.057962	-0.077538	-0.17720381	-0.0671739
Ba^{2+}	-0.04505	-0.070617	-0.17950783	-0.0706251
Ba^{2+}	-0.058915	-0.073338	-0.19009028	-0.0644032
Ca^{2+}	0.087184	-0.014062	0.084371956	0.09427711
Ca^{2+}	0.1001736	-0.028581	0.097058929	0.08853175
Ca^{2+}	0.0971477	-0.02266	0.087255359	0.08304596
Ca^{2+}	0.1025236	-0.033346	0.076535722	0.08640505
Ca^{2+}	0.0907552	-0.024772	0.073660597	0.07567558

Table S7. Training matrix of response patterns by four sensing elements against eight metal ions at **50 μM**

Metal Ions	Pdots-MG	Pdots-NPG	Pdots-DG	Pdots
Al^{3+}	0.088764	0.099715	0.035606	0.073389
Al^{3+}	0.089121	0.101873	0.030681	0.07324
Al^{3+}	0.089289	0.099222	0.026442	0.073757
Al^{3+}	0.085351	0.108571	0.043177	0.06494
Al^{3+}	0.085954	0.099375	0.030524	0.061372
Cu^{2+}	-0.33053	-0.29783	-0.23506	-0.31241
Cu^{2+}	-0.33918	-0.30438	-0.23445	-0.32032
Cu^{2+}	-0.34623	-0.30592	-0.23909	-0.31345
Cu^{2+}	-0.33667	-0.30962	-0.23641	-0.31876
Cu^{2+}	-0.33879	-0.30643	-0.23435	-0.31921
Co^{2+}	-0.08195	-0.12313	-0.24825	-0.04975
Co^{2+}	-0.07818	-0.13351	-0.25565	-0.04166
Co^{2+}	-0.08408	-0.14428	-0.25499	-0.03687
Co^{2+}	-0.08069	-0.14884	-0.24983	-0.04529
Co^{2+}	-0.08294	-0.14558	-0.25914	-0.03021
Ni^{2+}	-0.01623	-0.09688	-0.26654	-0.04872
Ni^{2+}	-0.02212	-0.10208	-0.26824	-0.0576
Ni^{2+}	-0.01483	-0.09155	-0.26885	-0.05943
Ni^{2+}	-0.02593	-0.10695	-0.27891	-0.05628
Ni^{2+}	-0.02094	-0.11856	-0.27032	-0.06581
Mg^{2+}	-0.00159	-0.03943	0.032633	0.054433
Mg^{2+}	0.001707	-0.03894	0.041372	0.06088
Mg^{2+}	-0.00168	-0.04388	0.027877	0.040346
Mg^{2+}	-0.00757	-0.05042	0.041551	0.050685
Mg^{2+}	0.001053	-0.05224	0.029458	0.05204
Pb^{2+}	-0.24822	-0.26269	-0.09283	-0.22195
Pb^{2+}	-0.25471	-0.2728	-0.09466	-0.20689
Pb^{2+}	-0.26172	-0.26951	-0.08563	-0.23398
Pb^{2+}	-0.24651	-0.26812	-0.10279	-0.21147
Pb^{2+}	-0.25762	-0.27308	-0.10231	-0.22365
Ba^{2+}	0.008797	0.006978	0.00048	0.030544
Ba^{2+}	0.013528	0.004552	0.003775	0.02877
Ba^{2+}	0.008324	0.011002	0.010681	0.026711
Ba^{2+}	0.007092	0.007818	0.004051	0.018608
Ba^{2+}	0.007833	-0.01094	0.00053	0.021328
Ca^{2+}	-0.01299	-0.07	-0.19893	-0.08918
Ca^{2+}	-0.0219	-0.07114	-0.19756	-0.08473
Ca^{2+}	-0.02082	-0.06441	-0.20859	-0.0962
Ca^{2+}	-0.02619	-0.06855	-0.20219	-0.08578
Ca^{2+}	-0.0263	-0.06702	-0.21257	-0.0868

Table S8. Training matrix of the response patterns against Cu^{2+} and Pb^{2+} ions and their binary mixtures with different proportions.

Metal Ions	Pdots-MG	Pdots-NPG	Pdots-DG	Pdots
Pb^{2+}	0.013939837	-0.0708943	0.484509224	0.20262333
Pb^{2+}	0.014933789	-0.0736381	0.481543924	0.19929761
Pb^{2+}	0.004985358	-0.0801714	0.514239912	0.19046447
Pb^{2+}	0.010316148	-0.0694024	0.49863648	0.20807975
Pb^{2+}	0.011579759	-0.0744797	0.489673247	0.19694521
Cu^{2+}:Pb^{2+}=1:4	-0.147276439	-0.1021595	0.286748348	0.18361125
Cu^{2+}:Pb^{2+}=1:4	-0.146973351	-0.0989023	0.282788573	0.17991304
Cu^{2+}:Pb^{2+}=1:4	-0.1476865	-0.104756	0.273928931	0.18292172
Cu^{2+}:Pb^{2+}=1:4	-0.158914141	-0.1107653	0.278520613	0.18468214
Cu^{2+}:Pb^{2+}=1:4	-0.153104204	-0.1133934	0.270715013	0.18820741
Cu^{2+}:Pb^{2+}=1:2	-0.149139541	-0.109728	0.220538001	0.08899649
Cu^{2+}:Pb^{2+}=1:2	-0.151943109	-0.1104203	0.225554407	0.08420966
Cu^{2+}:Pb^{2+}=1:2	-0.140655295	-0.1164949	0.21203057	0.08437817
Cu^{2+}:Pb^{2+}=1:2	-0.160436269	-0.1175638	0.212952532	0.08682369
Cu^{2+}:Pb^{2+}=1:2	-0.156612007	-0.1116491	0.212367241	0.08846881
Cu^{2+}:Pb^{2+}=1:1	-0.098762241	-0.1276699	0.212918865	0.01412991
Cu^{2+}:Pb^{2+}=1:1	-0.111505324	-0.1213491	0.208845139	0.00443209
Cu^{2+}:Pb^{2+}=1:1	-0.109767023	-0.1242107	0.21688641	0.01251804
Cu^{2+}:Pb^{2+}=1:1	-0.109869538	-0.1246694	0.225927336	0.00584441
Cu^{2+}:Pb^{2+}=1:1	-0.10112009	-0.1237562	0.209914719	0.00471145
Cu^{2+}:Pb^{2+}=2:1	-0.127631409	-0.1537484	0.191724095	-0.0265083
Cu^{2+}:Pb^{2+}=2:1	-0.126265283	-0.1534286	0.194430416	-0.0252467
Cu^{2+}:Pb^{2+}=2:1	-0.130067259	-0.1484986	0.179811101	-0.0340555
Cu^{2+}:Pb^{2+}=2:1	-0.134722786	-0.1590192	0.19308891	-0.0278807
Cu^{2+}:Pb^{2+}=2:1	-0.13133087	-0.1542239	0.183268459	-0.0338404
Cu^{2+}:Pb^{2+}=4:1	-0.170518415	-0.1593559	0.225039041	-0.0950028
Cu^{2+}:Pb^{2+}=4:1	-0.179100719	-0.1605426	0.22623293	-0.09428
Cu^{2+}:Pb^{2+}=4:1	-0.176832013	-0.1547016	0.221322705	-0.0928166
Cu^{2+}:Pb^{2+}=4:1	-0.181587827	-0.1610097	0.221079265	-0.0932689
Cu^{2+}:Pb^{2+}=4:1	-0.18313224	-0.1582154	0.2282426	-0.0928477
Cu^{2+}	-0.217456999	-0.116093	0.142378403	-0.1392039
Cu^{2+}	-0.212516213	-0.112133	0.140205577	-0.1350734
Cu^{2+}	-0.210472595	-0.1195501	0.139586619	-0.1375477
Cu^{2+}	-0.218116662	-0.1248188	0.137538102	-0.1359713
Cu^{2+}	-0.212750215	-0.1111841	0.142212657	-0.1407404

Table S9. Comparison of different sensor arrays for the detection of metal ions.

Sensor array	Kinds of metal ions	Detection limit (μM)	Ref.
Nitrogen-doped carbon dots	6	10	S1
Amino acids-modulating QDs	9	0.5	S2
Carbon nanodots	6	16	S3
Thiophene probes	9	100	S4
Citrate-capped gold nanoparticles	4	5	S5
Gold nanoparticles	6	0.3	S6
Polymer dots	8	1	This work

Reference:

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