Supporting Information

Ultrasensitive Colorimetric Assay of Cadmium Ion Based on Silver Nanoparticles Funtionalized with 5-Sulfosalicylic Acid for Wide Practical Applications

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Pretreatment for real samples

The milk samples pretreatment procedure was carried out following the general procedure.[1] Briefly, 2 g milk product was added into 1.5 mL of 10% trichloroacetic acid and 5.0 mL of acetonitrile mixture to remove proteins. The mixture solution was transferred to centrifugal tube to undergo sonication for 10 min and then centrifuged at 12, 000 rpm for 15 min. The supernatant was filtered through a 0.22 μM membrane filter to remove lipids. The pH of filtrate was adjusted to 6.8, and the filtrate was filtered through 0.22 μM membrane filter again after centrifugation. The filtered liquid was diluted with water to 10 mL for further analysis.

500 µL of human serum was placed in a centrifuge tube and 2.0 mL of acetonitrile was added to precipitate proteins. After vortex-mixing, the sample was centrifuged at 4, 000 rpm for 15 min, and the supernatant was transferred into a 25 mL volumetric flask and diluted to the mark with deionized water. An appropriate aliquot of this solution was taken for analysis according to the general procedure.

Urine samples were diluted by 100-fold and an appropriate aliquot of this solution was taken for analysis according to the general procedure. No further pretreatment was necessary.

Water samples were deposited overnight.

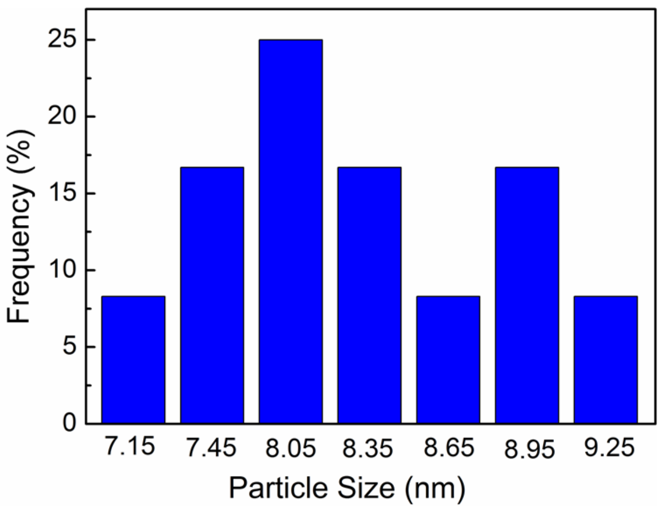

Fig. S1 Particle size distribution histogram of SAA-AgNPs.

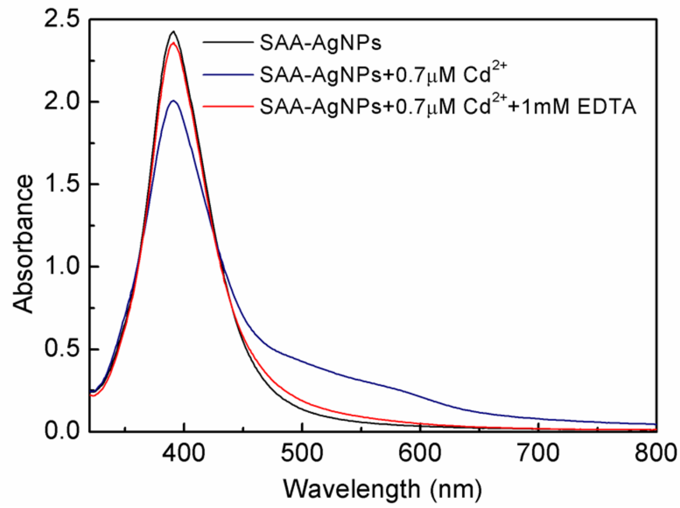

Fig. S2 Absorption spectra of SAA-AgNPs (black line), SAA-AgNPs-Cd^{2+} (blue line) and SAA-AgNPs-Cd^{2+} (red line) in the presence of chelating agent EDTA.

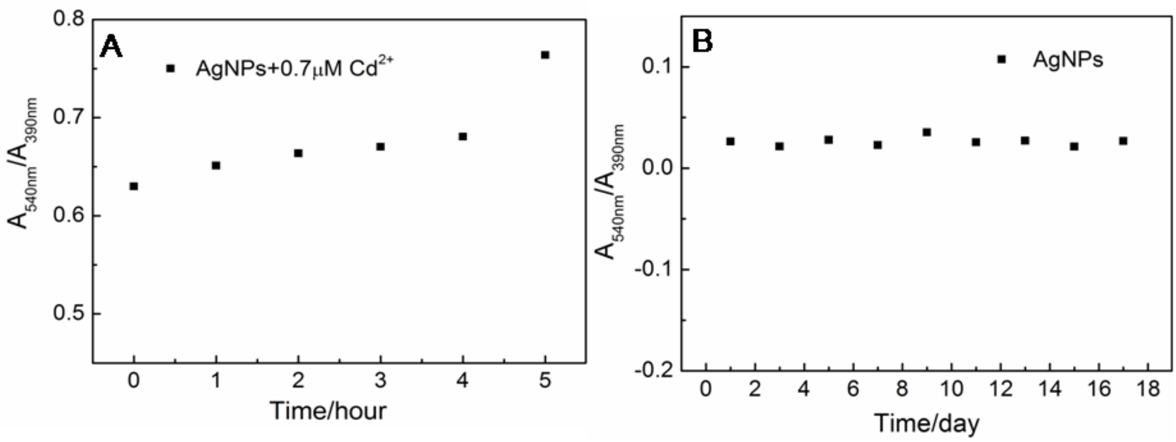

Fig. S3 Absorbance changes of the AgNPs upon the addition of Cd^{2+} at 25 ºC for 5 h (A) and stored at 4 ºC in the dark for 18 days (B), respectively.

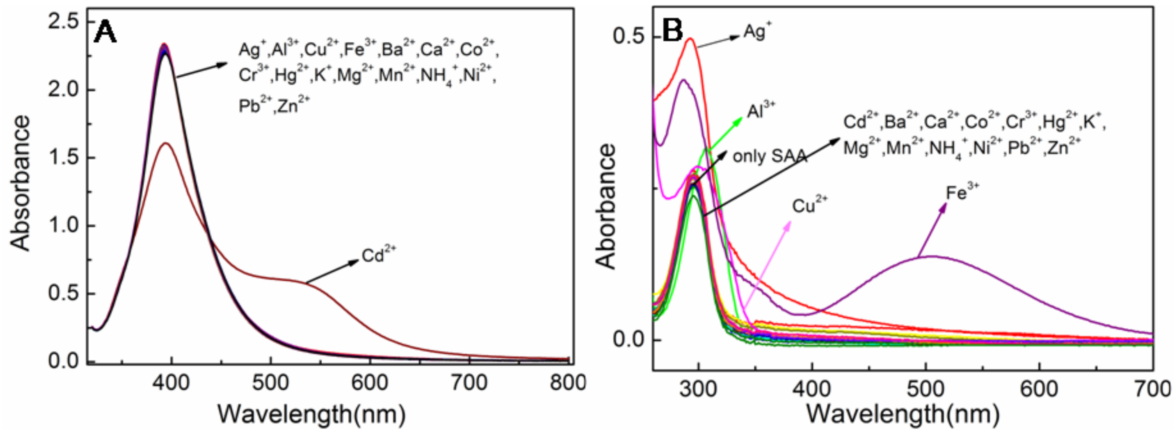

Fig. S4 Absorption spectra of (A) SAA-AgNPs in the presence and absence of metal ions (0.7 μM) and (B) SAA (0.1 mM) in the presence and absence of metal ions (70 μM).

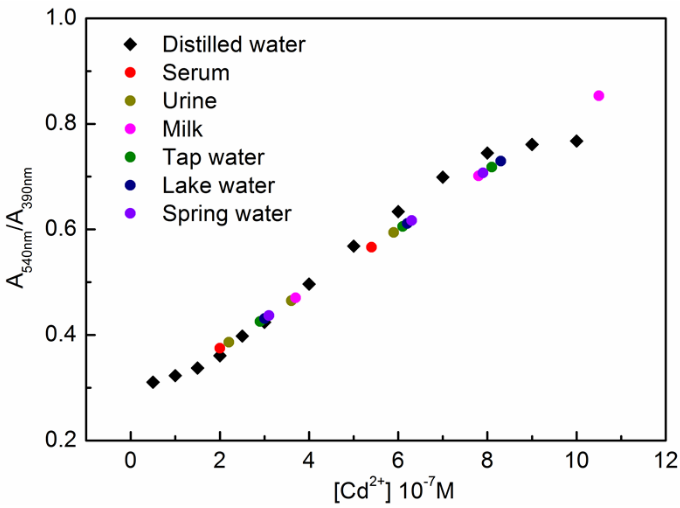

Fig. S5 Relationship between the ratio A_{540nm}/A_{390nm} and the concentration of Cd^{2+} detection in distilled water, serum, urine, milk and water samples.

Table S1 Cd^{2+} Detection Methods Published.

Method	Linearity range	LOD	Response to ions	Recovery matrices	Ref.
N-(2-hydroxybenzyl)-isoleucine functionalized **AgNPs**	NA	8.9 μM	Cd^{2+}, Hg^{2+}, Pb^{2+}	water	26
4-amino-3-hydrazino-5-mercapto - 1,2,4-triazole modified AuNPs	0.06-0.48 μM	0.03 μM	Cd^{2+}, Pb^{2+}, Ni^{2+}, Co^{2+}, Zn^{2+}, Hg^{2+}	water	23
AuNPs based lateral flow Immunodevice	3.6-89 nM	0.90 nM	Cd^{2+}	water	24
Label-Free **AuNPs**	None	5.0 μM	Cd^{2+}	rice	25
Peptide-modified **AuNPs**	0.50-2.0 μM	50 *n*M	Cd^{2+}, Ni^{2+}, Co^{2+}	water	27
Polymer mediated aggregation of **AuNPs**	0-0.4 μM	4.6 nM	Cd^{2+}, Hg^{2+}, Pb^{2+}, Cu^{2+}, Zn^{2+}	none	S1
Quantum dots CdTe conjugated fluorescein	0.1-15 μM	12 *n*M	Cd^{2+}	water HSA	S2
Turn-on fluorescent **InP nanoprobe**	0.2-10 μM	0.10 μM	Cd^{2+}	water	S3
ZnS:Mn nanoparticles functionalized by PAMAM-OH dendrimer based **fluorescence** ratiometric probe	23.4-1100 μM	23.44 μM	Cd^{2+}	water	S4
Colorimetric and fluorogenic detection of Cd^{2+}	0-4 μM	0.70 μM	Cd^{2+}, Zn^{2+}, Cu^{2+}	none	S5
Two-Photon **fluorescent Probe**	NA	23.63 nM	Cd^{2+}, Zn^{2+}	live cells image	34
Ratiometric indicator based surface-enhanced **raman spectroscopy**	0.01-0.21 μM	2.9 nM	Cd^{2+}	water	S6
Ratiometric **electrochemical** sensor	0.1-10 μM	10 nM	Cd^{2+}	water	S7
Voltammetric detection of cadmium ions	NA	5.0 nM	Cd^{2+}, Pb^{2+}, Cu^{2+}	none	S8
Electrochemical sensor for the sensitive detection of Cd^{2+}nanographeneand Nafion	2.22-44.5 nM	0.03 nM	Cd^{2+}	water	S9
Photoelectrochemical detection of Cd^{2+} based on **electrodeposited** on TiO_2 nanotubes	10^{-9}-10^{-2} M	0.35 nM	Cd^{2+}	water	S10
SnO_2/reduced graphene oxide nanocomposite for the simultaneous **electrochemica**l detection	0-1.3 μM	0.101 nM	Cd^{2+}, Cu^{2+}, Hg^{2+}, Pb^{2+}	none	S11

Maize tassel–MWCNTs composite for Cd^{2+} detection using **cyclic voltammetry**	0.018-0.27 μM	4.5 nM	Cd^{2+}	water	S12
Determination of lead, cadmium and copper by **flame atomic absorption spectrometry**	0-0.36 μM	27 nM	Cd^{2+}, Pb^{2+}, Cu^{2+}	plant leaves	S13
Determination of Cd^{2+} in urine by tungsten-coil **ICP-AES**	0.0018-1.8 μM	1.8 nM	Cd^{2+}	urine	S14
Direct fluorescence detection of $Pb^{2+}$and Cd^{2+} by **HPLC**	5-200 nM	3.3 nM	Cd^{2+}, Pb^{2+}	water	S15
New **magnetic polymeric nanoparticles**	7.1-534 nM	0.80 nM	Cd^{2+}	diesel oil	S16
Magnetic nanoparticles as asorbent for the preconcentration and determination of Cd^{2+}	0.089-4.4 nM	0.033 nM	Cd^{2+}	food water	S17
SAA modified AgNPs	0.05-1.0 μM	3.0 nM	Cd^{2+}	water serum milk	This work

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