Electronic supporting information

Table S-1 Selection of QD–protein studies highlighting the methods used to acquire the binding information

QD type (size[a])	Functionalization	Protein[b]	Method[c]	Binding information	Ref.[d]
CdTe	mercaptopropionic acid	BSA	CE-LIF	binding constant	1
CdTe	*N*-hydroxysulfo-succinimide	transferrin	CE-LIF, CE-UV	stoichiometry	2
CdTe	mercaptopropionic acid	BSA, horseradish peroxidase	CE–LIF	percentage of conjugate	3
CdTe	mercaptopropionic acid	glycoprotein (lectin), antibody anti-vWF	CE-LIF	percentage of conjugate	4
CdSe/ZnS (4.8 nm)	glutathione	denatured BSA	CE-FL	dissociation constant, cooperativity coefficient	5
CdSe/ZnS	glutathione	protein A	CE-FL	stoichiometry	6
CdTe	2-mercaptoethylamine hydrochloride	HSA	FL	binding constant	7
CdTe (3 nm)	mercaptoacetic acid	BSA	FL	association constant	8
CdSe/ZnS (4 nm)	D-penicillamine or mercaptosuccinic acid	HSA	FL	binding constant, number of binding sites, location of binding sites on protein	9
			CD, FT-IR	conformational changes of proteins	
CdS (2–3 nm)	mercaptopropionic acid, L-cysteine or glutathione	lysozyme, BSA	FL	binding constant, number of binding sites	10
			CD	conformational changes of proteins	
ZnS (6 nm)	mercaptoacetic acid	BSA	FL	binding constant, number of	11

				binding sites	
CdSe/ZnS	2-aminoethanethiol	HSA, α1-acid glycoprotein, immunoglobulin G	SPR	association and dissociation rate constants	12
CdSe/ZnS	mercaptoacetic acid (3.4 nm)	HSA	FL	location of binding sites on protein	13
			CD, FT-IR	conformational changes of proteins	
			DLS	stoichiometry	

[a] Where available. [b] BSA = bovine serum albumin; HSA = human serum albumin. [b] LIF = laser-induces fluorescence; FL = fluorescence spectroscopy; CD = circular dichroism spectroscopy; FT-IR = Fourier transform infrared spectroscopy; SPR = surface plasmon resonance spectroscopy; DLS = dynamic light scattering. [d] (1) Shao, L. W.; Dong, C. Q.; Huang, X. Y.; Ren, J. C. *Chin. Chem. Lett*. **2008**, *19*, 707–710; (2) Mei, F.; Zhao, X.-Y.; Zhang, L.; Qu, F. *Chin. J. Anal. Chem*. **2013**, *41*, 725–731; (3) Huang, X.; Weng, J.; Sang, F.; Song, X.; Cao, C.; Ren, J. *J. Chromatogr. A* **2006**, *1113*, 251–254; (4) Weng, J.; Song, X.; Li, L.; Qian, H.; Chen, K.; Xu, X.; Cao, C.; Ren, J. *Talanta* **2006**, *70*, 397–402; (5) Wang, J.; Li, J.; Li, J.; Qin, Y.; Wang, C.; Qiu, L.; Jiang, P. *Electrophoresis* **2015**, *36*, 1523–1528; (6) Wang, J.; Qiu, L.; Wang, C.; Zhang, Y.; Li, J.; Xia, J.; Jiang, P. *Int. J. Mol. Sci*. **2013**, *14*, 19146–19154; (7) He, Y.; Yin, P.; Gong, H.; Peng, J.; Liu, S.; Fan, X.; Yan, S. *Sens. Actuators B* **2011**, *157*, 8–13; (8) Fan, J.; Zhou, J.; Sun, T.; Lü, S.; Tang, J.; Lü, J. *Chin. J. Chem.* **2010**, *28*, 2353–2358; (9) Bai, J.; Wang, T.; Wang, Y.; Jiang, X. *Biomater. Sci*. **2014**, *2*, 493–501; (10) Huang, D.; Geng, F.; Liu, Y.; Wang, X.; Jiao, J.; Yu, L. *Colloids Surfaces A* **2011**, *392*, 191–197; (11) Wu, D.; Chen, Z.; Liu, X. *Spectrochim. Acta Mol. Biomol. Spectrosc*. **2011**, *84*, 178–183; (12) Xiao, Q.; Zhou, B.; Huang, S.; Tian, F.; Guan, H.; Ge, Y.; Liu, X.; He, Z.; Liu, Y. *Nanotechnol*. **2009**, *20*, 325101–325107; (13) Xiao, Q.; Huang, S.; Qi, Z.-D.; Zhou, B.; He, Z.-K.; Liu, Y. *Biochim. Biophys. Acta* **2008**, *1784*, 1020–1027.

Table S-2 Effect of background concentration on detectability[a]

HEPES concentration (mM)	Peak area ($\times 10^3$, arbitrary units)
10	631.1
20	704.1
40	483.2
60	447.1

[a] 1.17 μmol L^{-1} Cd; voltage, 10 kV; other conditions as in Table 1.

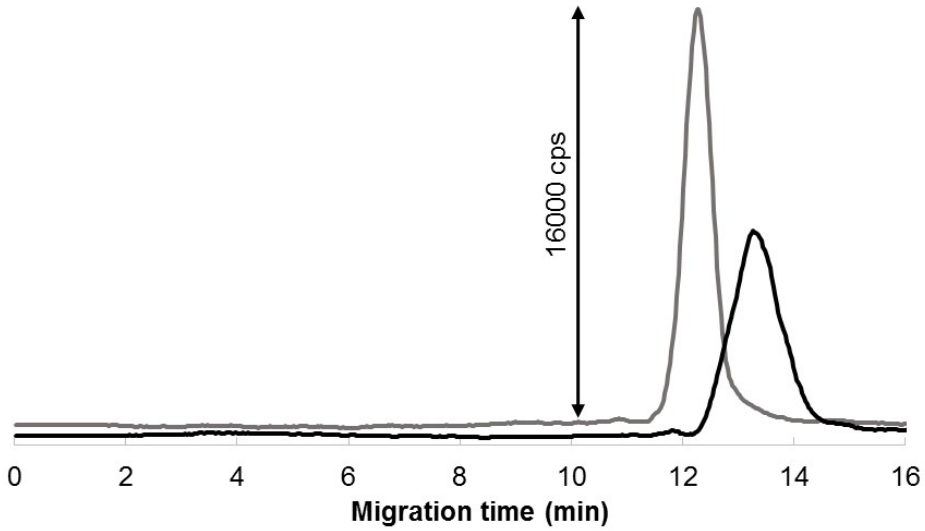

Fig. S-1 Electropherograms of QDs (1.17 µmol L^{-1} Cd) using different background electrolytes (gray – 10 mM HEPES, pH 7.4; black – 10 mM phosphate buffer, pH 7.4). Other CE-ICP-MS conditions, see Table 1.

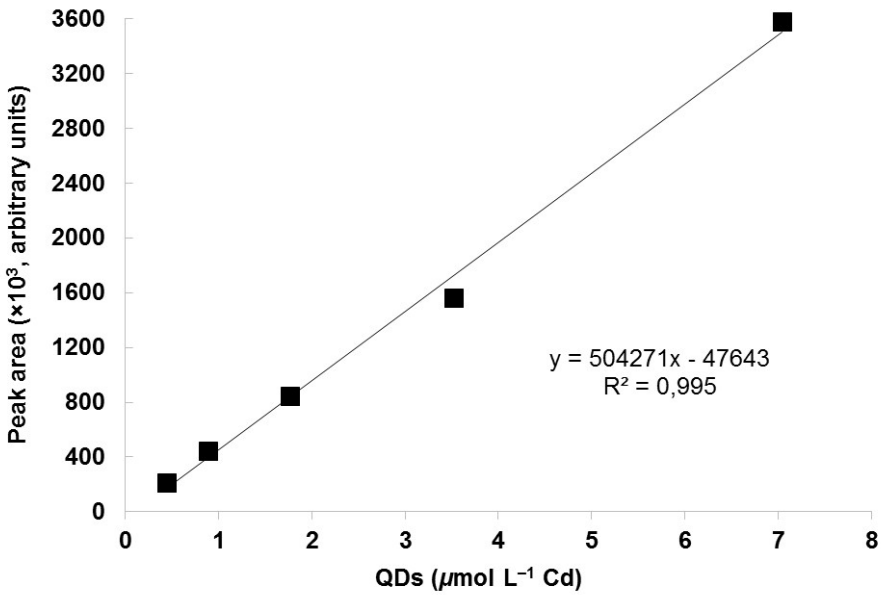

Fig. S-2 Linear response between the peak area and QDs concentration under optimized CE-ICP-MS conditions.

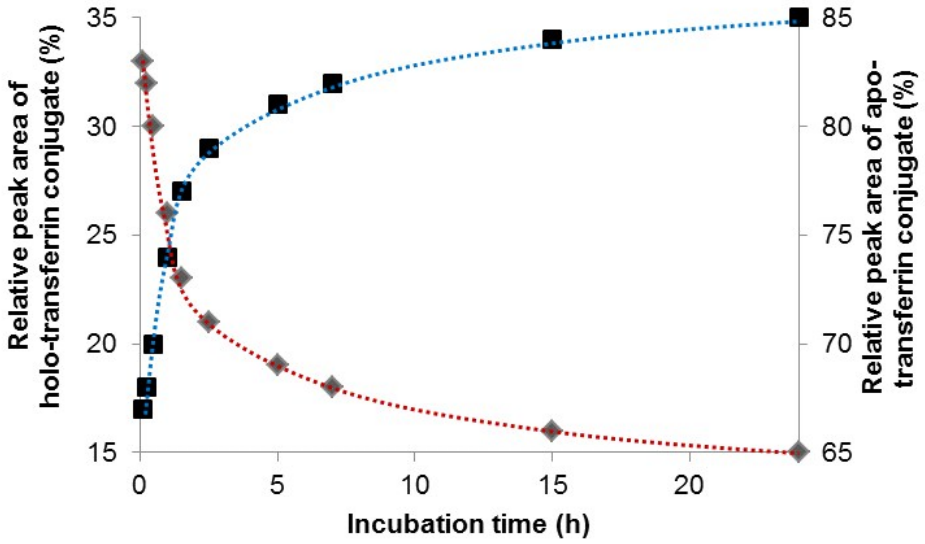

Fig. S-3 Time-dependent changes in CE-ICP-MS signals of QDs (0.877 μmol L^{-1} Cd) conjugates with holo-transferrin (diamonds) and apo-transferrin (squares).

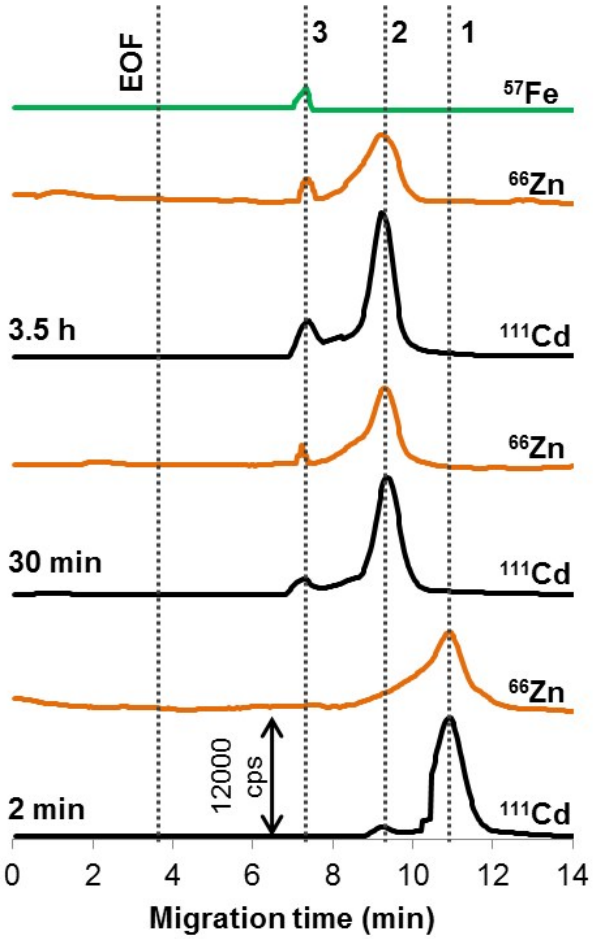

Fig. S-4 Electropherograms recorded for a mixture of QDs (0.675 μmol L^{-1} Cd) with transferrin (0.3 g L^{-1}) and albumin (4.5 g L^{-1}) at varied incubation time. Peaks: 1 – bare QDs; 2 – albumin conjugate; 3 – transferrin conjugate. See Table 1 and the Experimental section for CE-ICP-MS conditions.

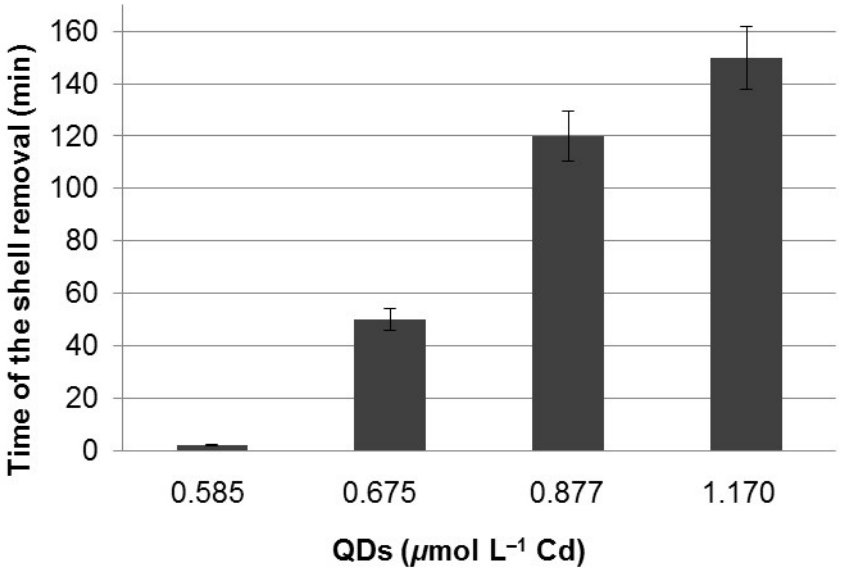

Fig. S-5 Time required to detaching the shell of QDs, varying in dosages, in 10-fold diluted human serum.