Electronic Supplementary Information (ESI)

Controlled synthesis of open-mouthed epitope-imprinted polymer nanocapsules containing a PEGylated nanocore for fluorescence detection of the target protein

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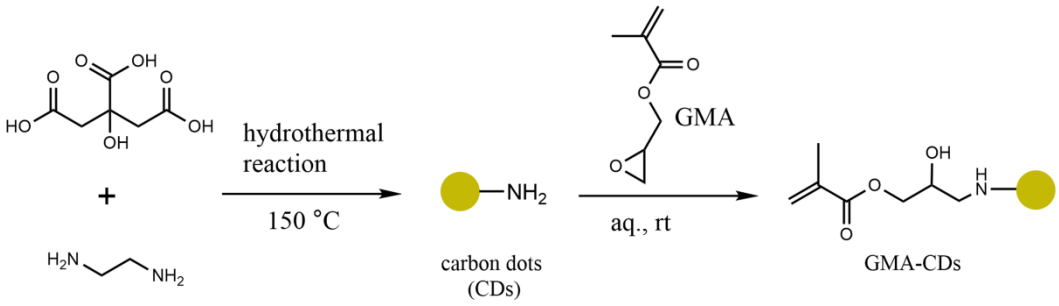

Scheme S1. Schematic illustration of the procedure for the synthesis and subsequent surface functionalization of carbon dots.

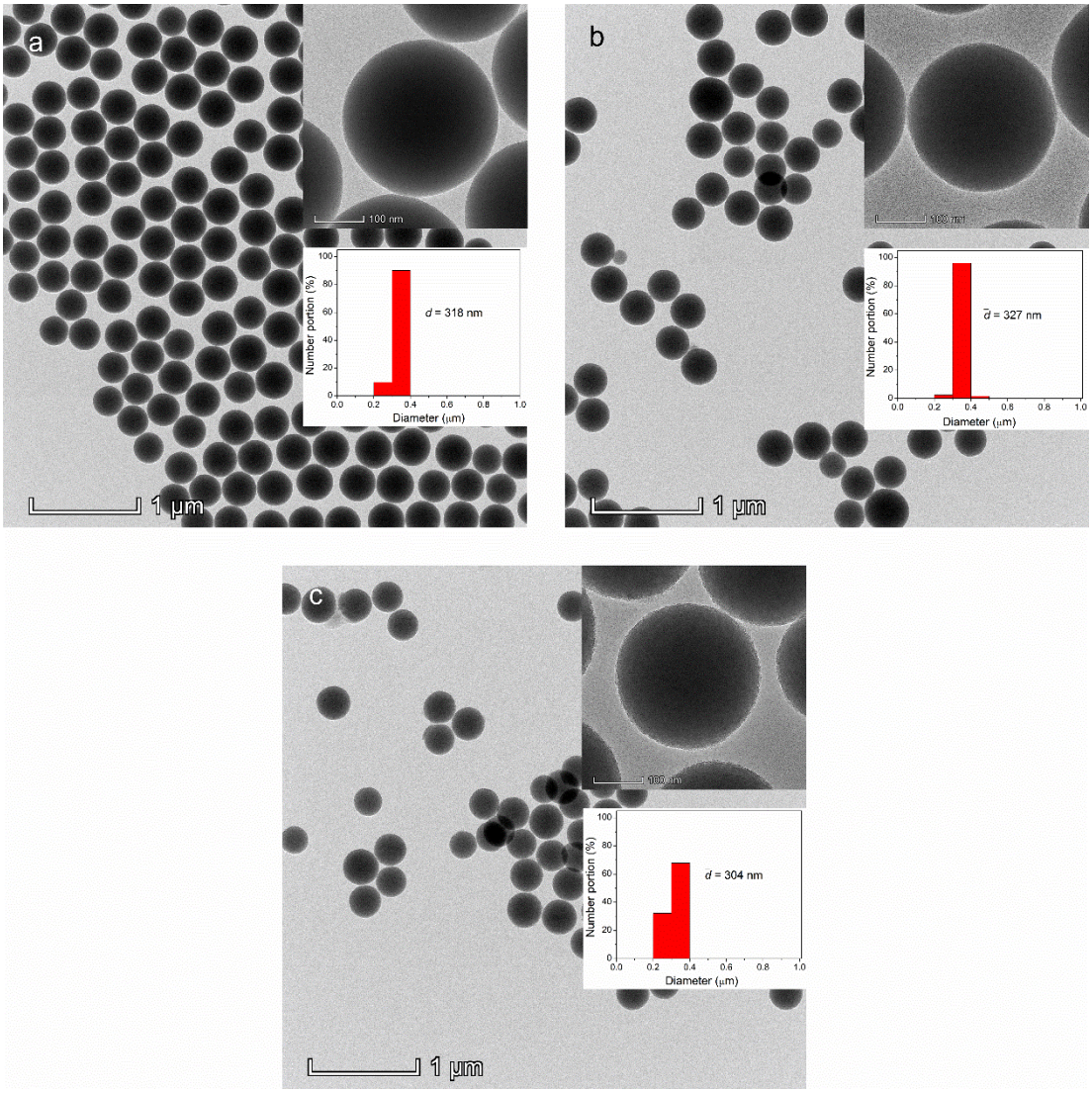

Fig. S1. TEM images of (a) the original SiO_2 NPs, (b) MIP JNPs obtained by surface-initiated ATRP over the SiO_2-NH_2// epitope/iB-Br JNPs, and (c) OM-MIP NCs obtained after partial

etching the SiO_2 nanocore inside the MIP JNPs. The insets (top) show the high-resolution images with a bar of 100 nm. The insets (bottom) indicate the counted size distribution.

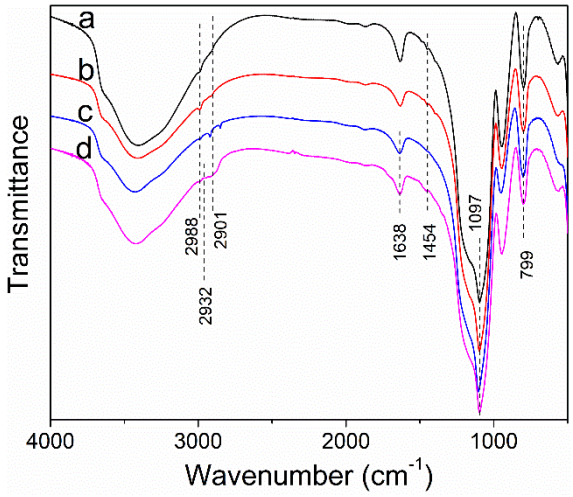

Fig. S2. FT-IR spectra of (a) SiO_2 NPs, (b) SiO_2-NH_2 NPs, (c) SiO_2-NH_2//iB-Br/Ac-Br JNPs and (d) SiO_2-PEG NPs. For all the particles, the strong and broad peak around 1097 cm^{-1} indicates the Si-O-Si asymmetric stretching, and the bands observed at around 799 cm^{-1} shows the Si-O vibration. For the SiO_2-NH_2 NPs, the peak at 1454 cm^{-1} corresponds to the N-H bending vibration, and the peaks at 2988 cm^{-1} and 2901 cm^{-1} correspond to the stretching vibration of C-H bonds of the methyl or methylene groups of APTES, confirming the surface modification of SiO_2 NPs by APTES. For the SiO_2-NH_2//iB-Br/Ac-Br JNPs, the appearance of characteristic bands at 1638 cm^{-1} represents the bromoisobutyrate residue. With respect to SiO_2-PEG NPs, the two peaks at 2932 cm^{-1} and 1638 cm^{-1} corresponding to the vibration of -CH_2- and C=O bonds suggest the successful modification with silanized m-PEG.

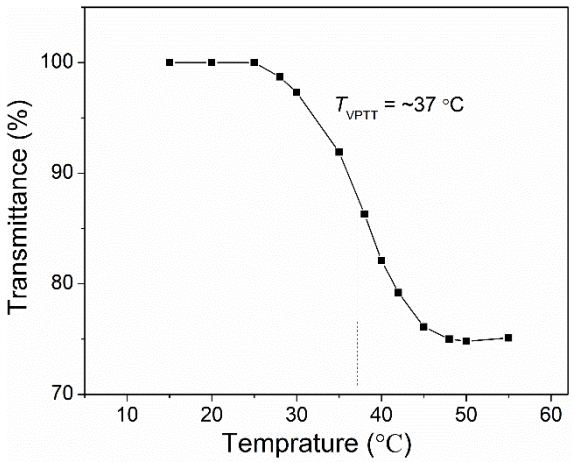

Fig. S3. Transmittance of OM-MIP NCs in the PB buffer with increasing temperatures. The The volume phase transition temperature (VPTT) was determined to be about 37 °C.

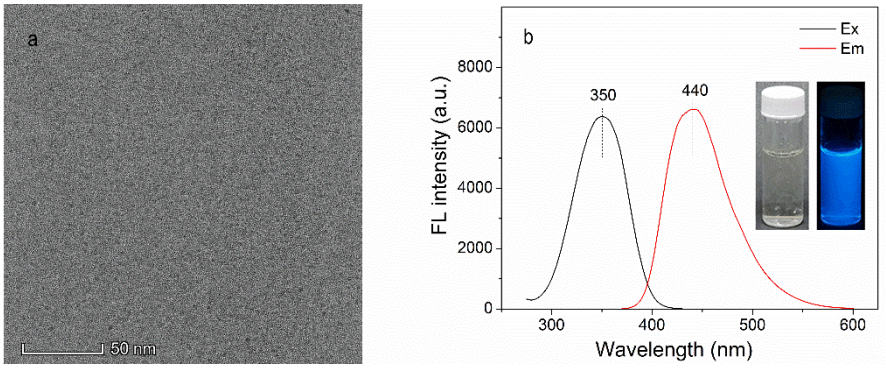

Fig. S4. (a) TEM image of the GMA-CDs. (b) FL excitation and emission spectra of the GMA-CDs dispersed in the PB buffer. The insets show the photographs of the GMA-CDs solution under sunlight (left) and a 365 nm UV lamp (right), respectively.

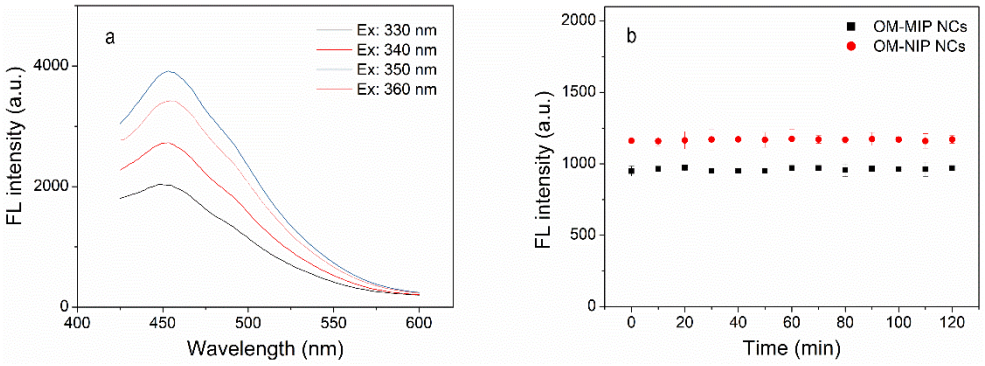

Fig. S5. (a) The FL emission spectra of the OM-MIP NCs dispersed in PB buffer under varied λ_{ex}. (b) The FL emission intensity change of the OM-MIP and OM-NIP NCs in PB buffer during continuous FL measurements.

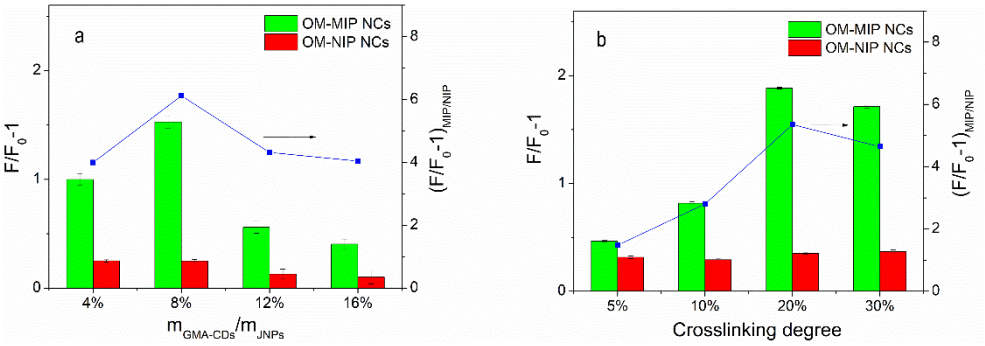

Fig. S6. The effect of (a) mass ratio of GMA-CDs relative to support JNPs and (b) molar crosslinking in the polymerization recipe on the FL response of the resultant OM-MIP and OM-NIP NCs.

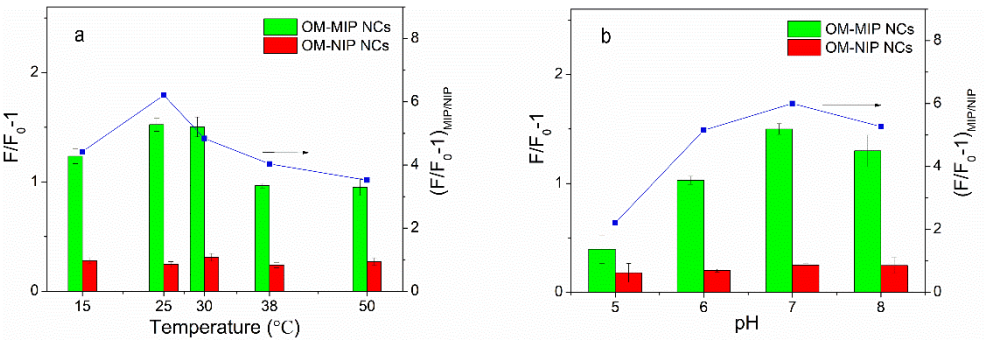

Fig. S7. The effect of (a) temperature and (b) pH on the FL response of the OM-MIP and OM-NIP NCs.

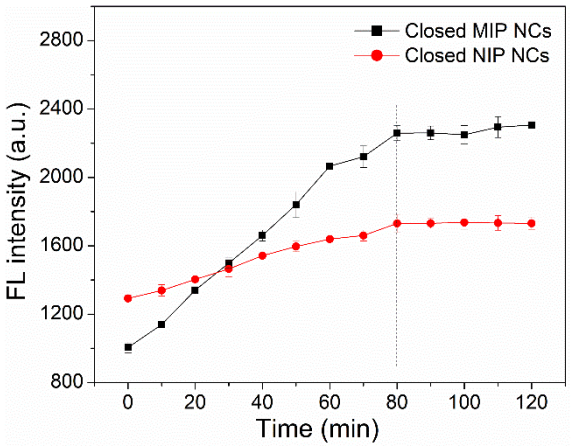

Fig. S8. FL response kinetics of the closed MIP and NIP NCs.

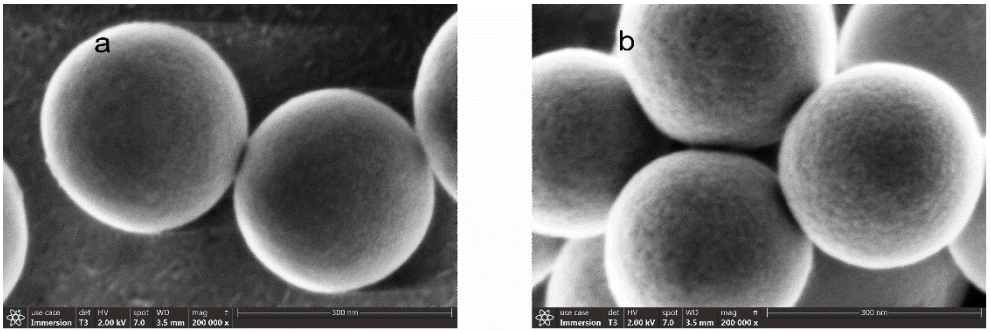

Fig. S9. SEM images of (a) the original SiO_2 NPs and (b) the SiO_2 NPs after partially etched with 80 mM of NH_4HF_2.

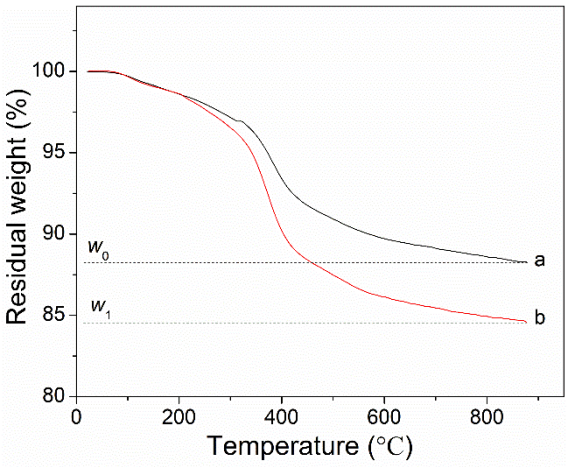

Fig. S10. TGA curves of (a) the original SiO_2 NPs and (b) PEGylated SiO_2 NPs. The amount of PEG chains grafted to the PEGylated SiO_2 was estimated to be ~42 mg/g.

Table S1. Comparison of the FL detection performance of the reported molecular imprinting based FL sensors for BSA or HSA detection.

FL substance	Template	Linear range (μM)	LOD (nM)	IF_{SV}	Ref.
ZnO QDs	BSA	3.0-30	-	2.4	[1]
MWCNT QDs	BSA	0.5-3.5	80.0	4.2	[2]
CdTe/CdS QDs	BSA	2-64	500	1.9	[3]
Dansyl	BSA	0.2-2.65	560	21	[4]
CdTe QDs	C-terminus nonapeptides of HSA	0.25-5	44.3	2.6	[5]
CdTe QDs	C-terminus nonapeptides of BSA	0.5-10	110	4.8	[6]
CDs	C-terminus nonapeptides of BSA	0.2-6	43.8	7.8	[7]
CDs	C-terminus nonapeptides of BSA	0.25-6	38.1	6.1	This work

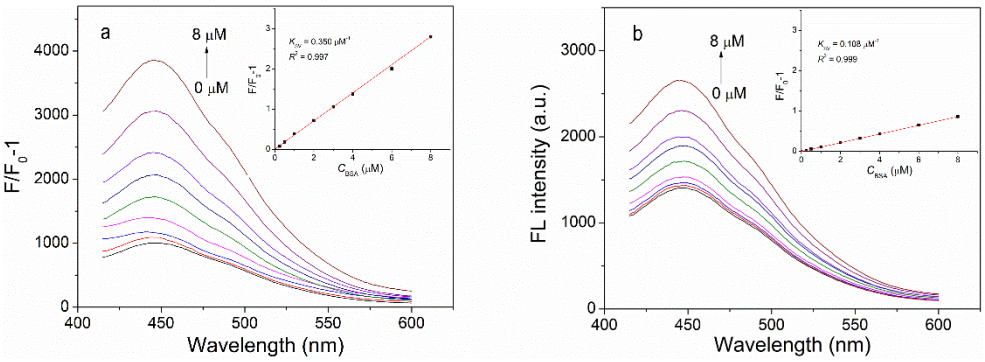

Fig. S11. FL emission spectra of (a) non-PEGylated OM-MIP and (b) non-PEGylated OM-NIP NCs in the presence of BSA (0–8 μM), respectively. The insets show the corresponding Stern–Volmer plots.

Table S2. The spiked recoveries and relative standard deviations (RSDs, %; n=3) for the detection of BSA in the 1000-fold diluted bovine serum using the OM-MIP NCs.

spiked (μM)	found (μM)	recovery ± RSDs (%) [a]
0	0.45 ± 0.02	-
0.5	0.97 ± 0.02	104.0 ± 4.6
1.0	1.43 ± 0.03	98.0 ± 2.6
2.0	2.47 ± 0.03	101.0 ± 1.7
4.0	4.44 ± 0.05	99.8 ± 1.2

[a] The recoveries were calculated based on the BSA concentration found in the spiked samples after subtraction of that found in the non-spiked sample.

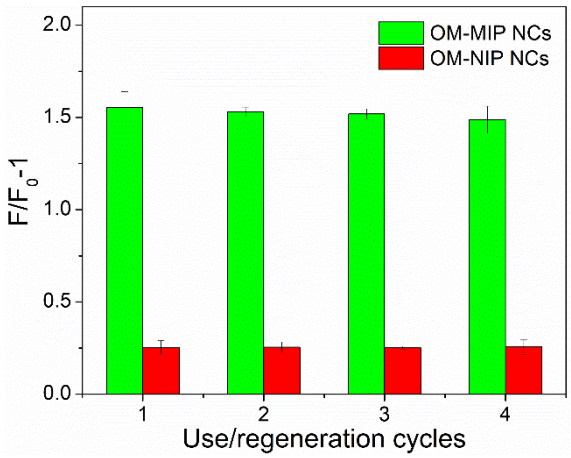

Fig. S12. The reusability of the OM-MIP NCs and OM-NIP NCs with 4 use/regeneration cycles. The used NCs were regenerated by washing with 1% SDS/1% acetic acid solution for removal of the BSA bound, followed by washing with NaCl solution (1 M) and water.

References

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