Electronic Supplementary Material (ESI) for Analyst.

Assembling of anisotropic plasmonic sheet-core-satellites for simultaneously ultrasensitive detection of MC-LR toxin

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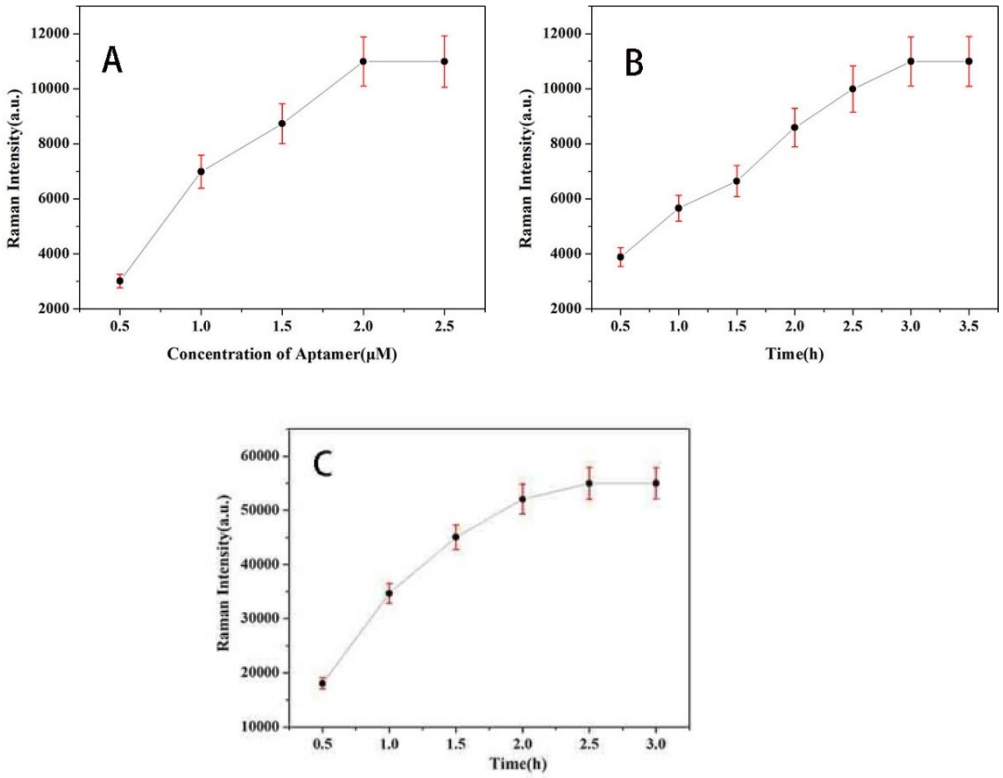

Fig. S1 Optimization of ss-DNA1/aptamer/ss-DNA2 hybridization. (a) concentration of aptamer with 0.5μM, 1.0μM, 1.5μM, 2.0μM and 2.5μM. (b) reaction time for formation of plasmonic core-satellites. (c) reaction time for formation of plasmonic sheet-core-satellites

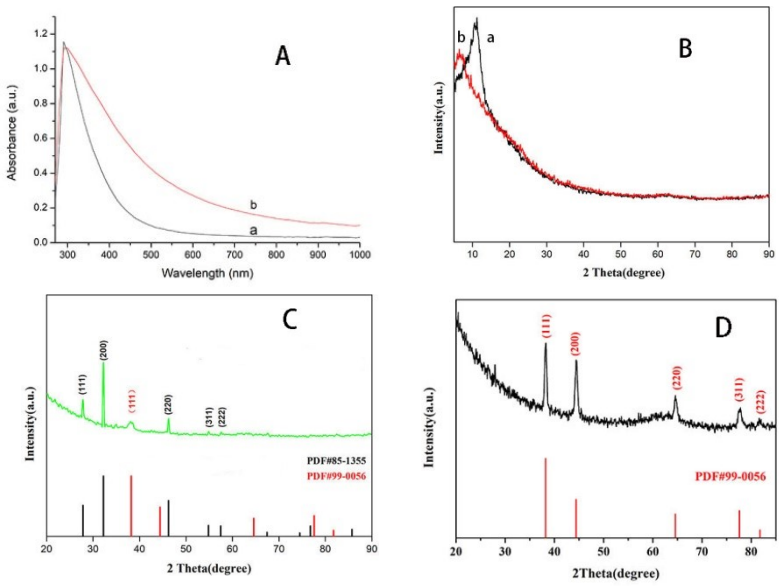

Fig. S2 A: UV-VIS-NIR spectra of (a) GO; (b) PEG-lyated GO; B: XRD pattern (a) GO, (b) PEGlyated; C: XRD pattern of pGO/hollow nanoplate AgCl:Au; D: XRD pattern of pGO/short Au nanorod

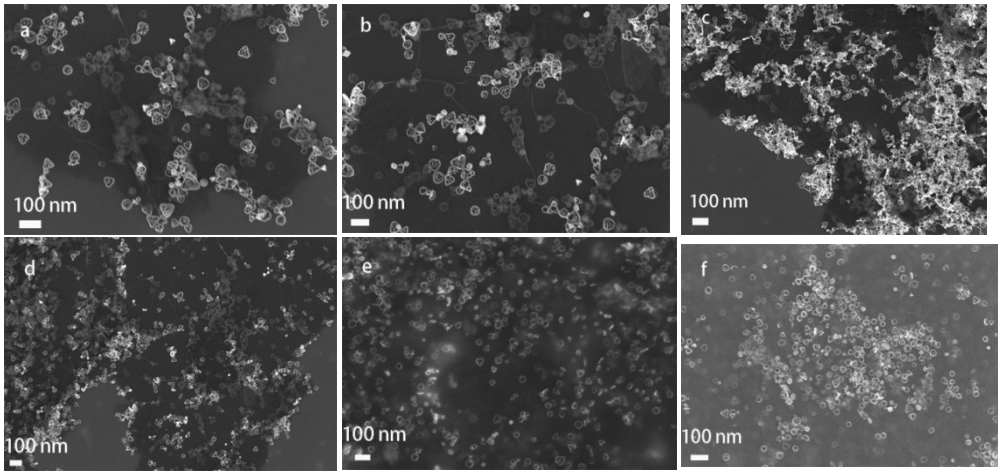

Fig. S3 (a-f) SEM image of pGO/hollow triangular AgCl:Au nanoplates/dotnanotags sheet-core-satellites in the presence of different concentration of MC-LR: (a) 0 nM, (b) 0.005nM, (c) 0.05nM, (d) 0.5nM, (e) 5nM, (f) 50nM

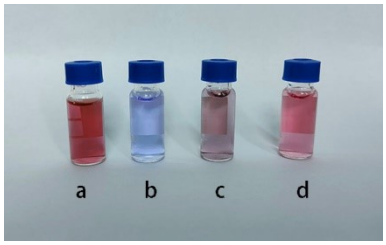

Fig. S4 Colorimetric observations of (a) mixture of ss-DNA1-gold nanoparticles and ss-DNA2-gold nanoparticles; (b) hybridization of ss-DNA1-gold nanoparticles/aptamer/ss-DNA2-gold nanoparticles; (c) hybridization of ss-DNA1-gold nanoparticles/aptamer/ss-DNA2-gold nanoparticles with 0.5nM MC-LR toxin; (d) hybridization of ss-DNA1-gold nanoparticles/aptamer/ss-DNA2-gold nanoparticles with 50nM MC-LR toxin

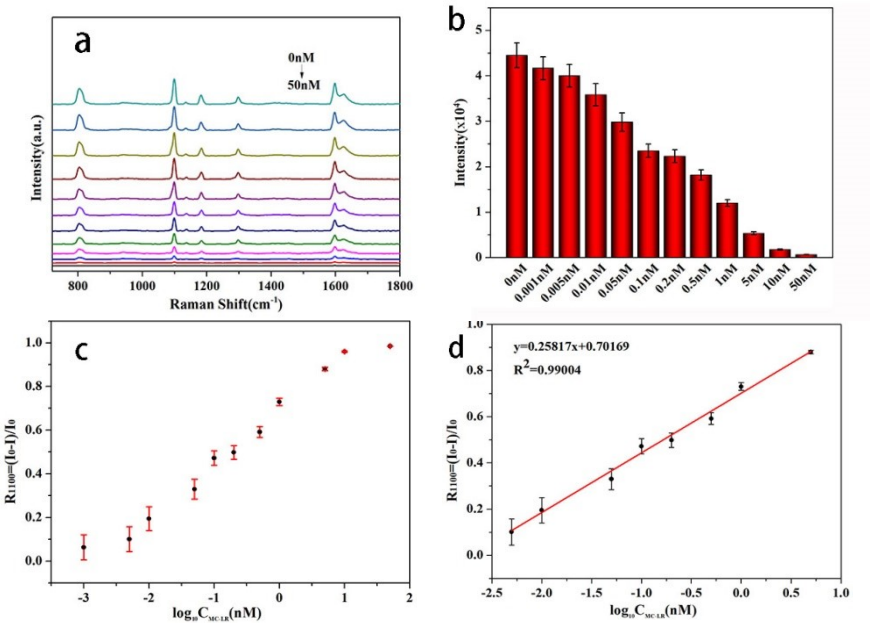

Fig. S5 a: SERS spectra of detecting microcystin-LR with different concentration via pGO/hollow triangular AgCl:Au nanoplate/dotnanotags sheet-core-satellites. b: Intensity of the Raman peak at 1100cm^{-1} of microcystin-LR with different concentration. c: plots of the intensities vs logarithmic MC-LR concentrations; d: standard curves between Raman signal and logarithmic MC-LR concentration.

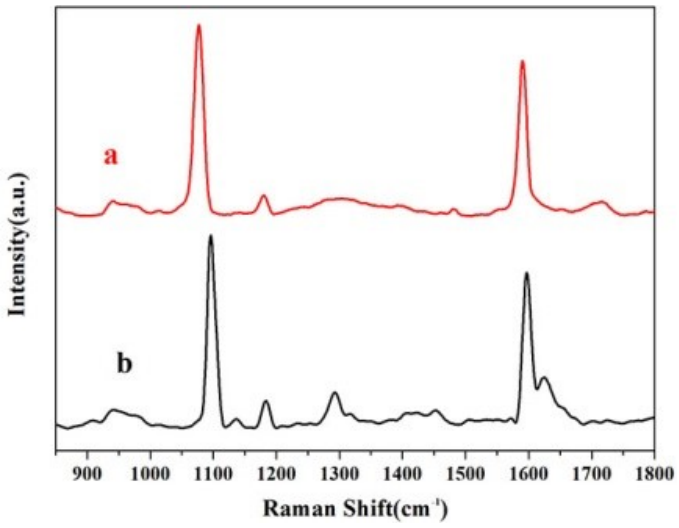

Fig. S6 SERS spectra of 4-MBA of short Au nanorod@dotnanotags core-satellites (a); 4-MBA of pGO/short Au nanorod/dotnanotags sheet-core-satellites

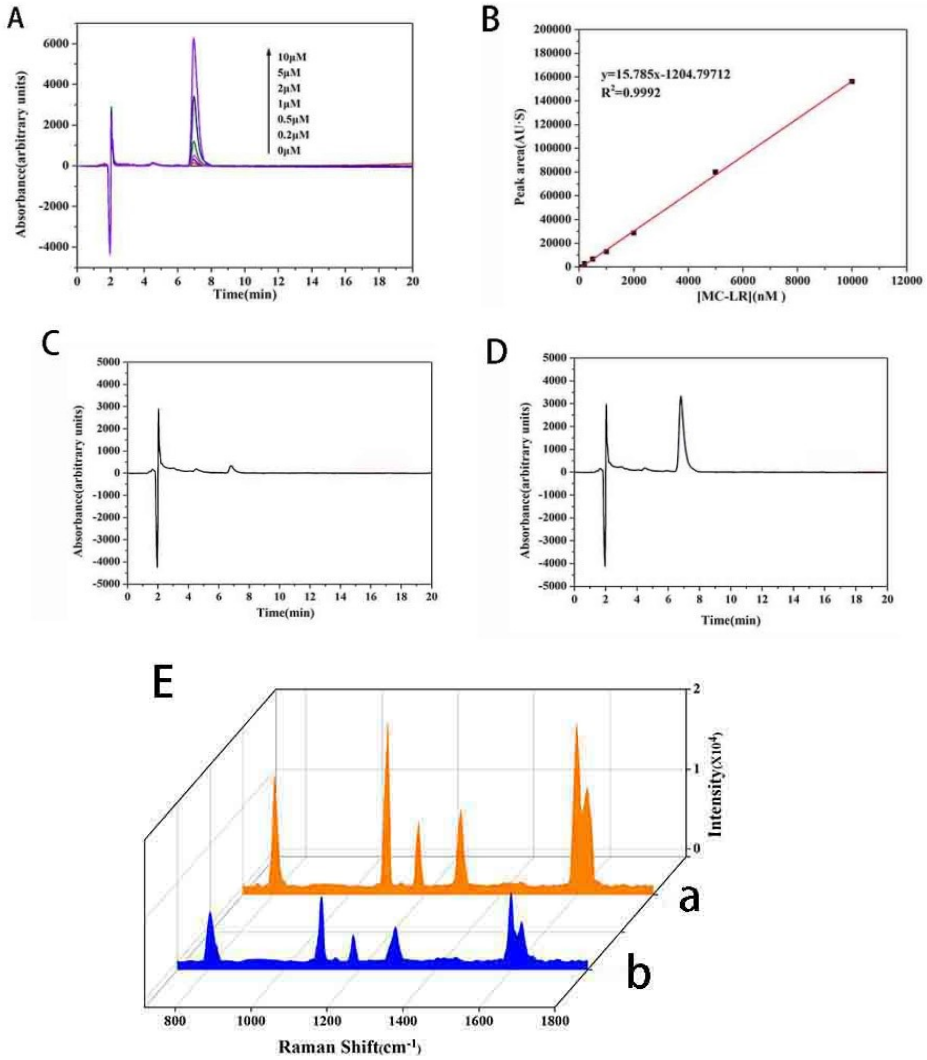

Fig.S7 A: Chromatogram of MC-LR toxin with concentration of 0μM, 0.2μM, 0.5μM, 1μM, 2μM, 5μM, 10μM; B: standard curve of MC-LR toxin; C: chromatogram of MC-LR toxin with concentration of 0.5nM spiked DongPu reservoir water after treatment by solid extraction approach for expanding 1000 times; D: chromatogram of MC-LR toxin with concentration of 5nM spiked DongPu reservoir water after treatment by solid extraction concentration approach for expanding 1000 times; E: The representative SERS spectra of pGO/short Au nanorod/dotnanotags sheet-core-satellites for the detection of MC-LR in DongPu reservoir water spiked samples with concentration of 0.5nM (curve a) and 5nM (curve b), respectively.

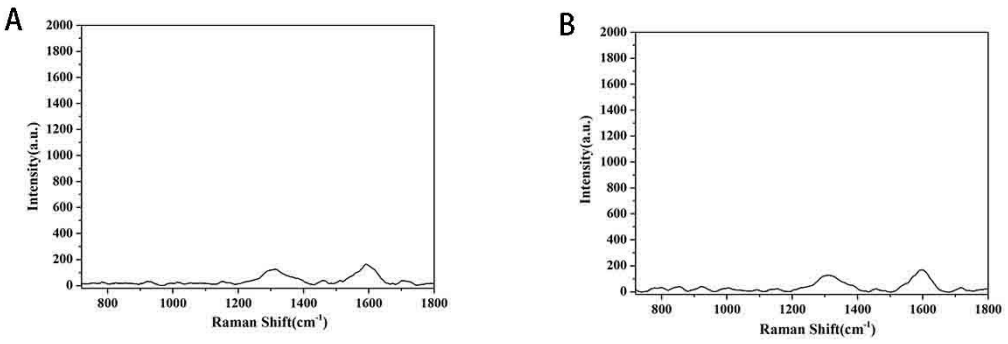

Fig. S8 A: SERS spectrum of tap water via pGO/short gold nanorods sheet-core plasmonic substrate; B: SERS spectrum of DongPu Reservoir water via pGO/short gold nanorods sheet-core plasmonic substrate

Table S1 DNA sequence of aptamer (DNA3) and ss-DNA.[1]

Sequence name	**Sequence**
DNA1	5'-SH-GCGGAGATGGGG
DNA2	5'-SH-CCCCCCCCCCCC
DNA3	5'-GGGGGGGGGGGGGGCGCCAAACAGGACCACCATGACA ATTACCCATACCACCTCATTATGCCCCATCTCCGC
DNA4	5'-GGGGGGGGGGGGGGCGCGGCGGCAAACTAACTAACGCGA GTAACATACCGGCATCATCAGCCACCCCTGCCGT
DNA5	5'-GGGGGGGGGGGGGCACGCACAACCAGGTCAAACATAGGG AAGAGTGAAGTTTGTACTGGGGGGCCAGTATGTG
DNA6	5'-GGGGGGGGGGGGGGGGCGCGCTAAAAGTAGGGGGATTG ATAAGGGTAAATCATGTATATCGGTGTACTCGCCG
DNA7	5'-GGGGGGGGGGGGGGACCGCGGCAACACGGACATCATTCT GAAATACGCCATAGTTCTTCAATAGGTTGGTGCC

Table S2 The recovery table showing the detection of MC-LR from tap water

Spiked concentration(nM)	Measured concentration(nM)	Recovery(%)	RSD(%)
0.005(sample 1)	0.005008±0.00009	100.2	1.79
0.05 (sample 2)	0.0491±0.0007	98.2	1.43
0.2 (sample 3)	0.203±0.0048	101.5	2.36
1 (sample 4)	0.986±0.018	98.6	1.83

Table S3 The recovery table showing the detection of MC-LR from DongPu reservoir water

Spiked concentration(nM)	Measured concentration(nM)	Recovery(%)	RSD(%)
0.005(sample 1)	0.00494±0.00013	98.8	2.63
0.05 (sample 2)	0.0483±0.0014	96.6	2.89

0.2 (sample 3)	0.209±0.004	104.5	1.91
1 (sample 4)	1.028±0.023	102.8	2.24

Table S4 The recovery table showing the detection of MC-LR from DongPu reservoir water via HPLC and SERS measurement

Spiked concentration(nM)	Detection method	Measured concentration(nM)	Recovery(%)	RSD(%)
0.5(sample5)	This work	0.4895±0.013	97.9	2.74
	HPLC	0.5086±0.01	101.7	1.97
5 (sample6)	This work	5.1603±0.112	103.2	2.17
	HPLC	4.9533±0.046	99.1	0.93

[1] A, Ng, R. Chinnappan, S. Eissa, H. C. Liu, C, Thili, M. Zourob, *Environ. Sci. Technol.,* 2012, **46,** 10697-10703.