Electronic Supplementary Material (ESI) for Analytical Methods.

A visual detection of Bisphenol A based on peroxidase-like activity of hemin-graphene composites and aptamer

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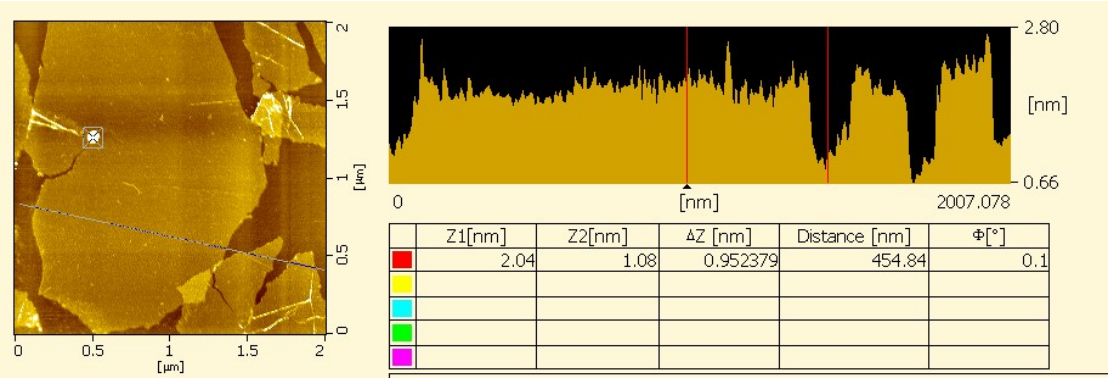
Table S1. Comparisons of proposed method with other reported aptamer based strategies for BPA detection.

Strategy	signal	LOD	Linear range	Ref
AuNPs，aptamer	Colorimetry	0.049 ng/mL	0.01-10,000 ppb	1
Cationic polymer，AuNPs，aptamer	Colorimetry	1.50 nM	1.50-500 nM	2
VC, AuNPs, aptamer	Colorimetry	0.083 ng /mL	3.33–333.3 ng /mL	3
Aptamer, gold nanoparticles dotted graphene	Electrochemistry	5 nM	0.01 uM -10 uM	4
Aptamer	Electrochemistry	0.284 pg/mL	0.1-1000 pg/mL	5
PAMAM–Fe_3O_4, aptamer	Electrochemistry	5×10^{-9}M	1×10^{-8}-3.07×10^{-6} M	6
GO, aptamer	Fluorescence	0.05 ng/mL	0.1-10 ng/mL	7
AuNPs, aptamer	Fluorescence	0.01 pg /mL	10 000 pg /mL- 0.1 pg/ mL	8
Magnetic bead, quantum dots, AuNPs, aptamer	Fluorescence	0.0005 ng/mL	0.0005-1.0 ng/mL	9
H-GNs, aptamer	Colorimetry	2 nM	5-100 nM	This work

Reference:

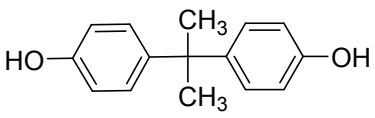
1. Mei Z, Chu H, Chen W, et al. Ultrasensitive one-step rapid visual detection of bisphenol A in water samples by label-free aptasensor[J]. Biosensors and Bioelectronics, 2013, 39(1): 26-30.
2. Zhang D, Yang J, Ye J, et al. Colorimetric detection of bisphenol A based on unmodified aptamer and cationic polymer aggregated gold nanoparticles[J]. Analytical biochemistry, 2016, 499: 51-56.
3. Yao D, Wen G, Jiang Z. A highly sensitive and selective resonance Rayleigh scattering method for bisphenol A detection based on the aptamer–nanogold catalysis of the $HAuCl_4$–vitamin C particle reaction[J]. RSC Advances, 2013, 3(32): 13353-13356.
4. Zhou L, Wang J, Li D, et al. An electrochemical aptasensor based on gold nanoparticles dotted graphene modified glassy carbon electrode for label-free detection of bisphenol A in milk samples[J]. Food chemistry, 2014, 162: 34-40..
5. Xue F, Wu J, Chu H, et al. Electrochemical aptasensor for the determination of bisphenol A in drinking water[J]. Microchimica Acta, 2013: 1-7.
6. Yin H, Cui L, Chen Q, et al. Amperometric determination of bisphenol A in milk using PAMAM–Fe_3O_4 modified glassy carbon electrode[J]. Food Chemistry, 2011, 125(3): 1097-1103.
7. Zhu Y, Cai Y, Xu L, et al. Building an aptamer/graphene oxide FRET biosensor for one-step detection of bisphenol A[J]. ACS applied materials & interfaces, 2015, 7(14): 7492-7496
8. Ragavan K V, Selvakumar L S, Thakur M S. Functionalized aptamers as nano-bioprobes for ultrasensitive detection of bisphenol-A[J]. Chemical Communications, 2013, 49(53): 5960-5962.
9. Lim H J, Chua B, Son A. Detection of bisphenol A using palm-size NanoAptamer analyzer[J]. Biosensors and Bioelectronics, 2017, 94: 10-18.

Figure S1: AFM characterization of GO sheets on mica substrate and the cross section identified by the line shows the heights of GO.

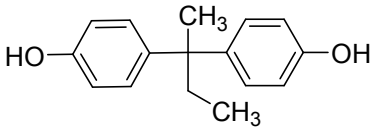


	Z1[nm]	Z2[nm]	ΔZ [nm]	Distance [nm]	Φ[°]
	2.04	1.08	0.952379	454.84	0.1

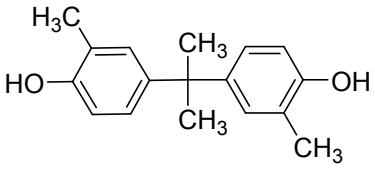
Figure S2: The chemical structure of BPA and different analogs.



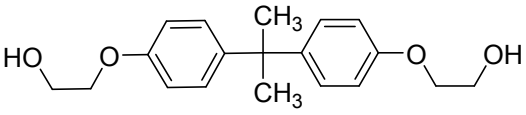
Bisphenol A (BPA)



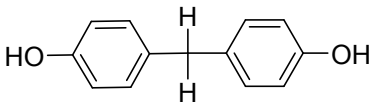
Bisphenol B (BPB)



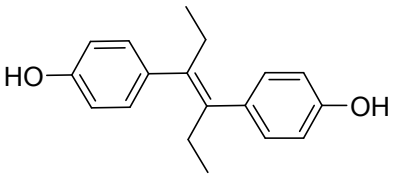
Bisphenol C (BPC)



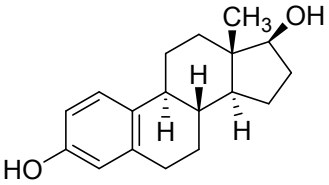
Bisphenol A ethoxylate (BPE)



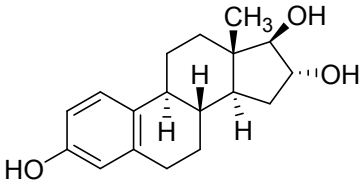
Bisphenol F (BPF)



Diethylstilbestrol (DES)



17β-estradiol (E2)



Estriol (E3)