Electronic Supporting Information

High sensitivity and rapid detection of Hepatitis B virus DNA using lateral flow biosensors based on Au@Pt nanorods in the absence of hydrogen peroxide

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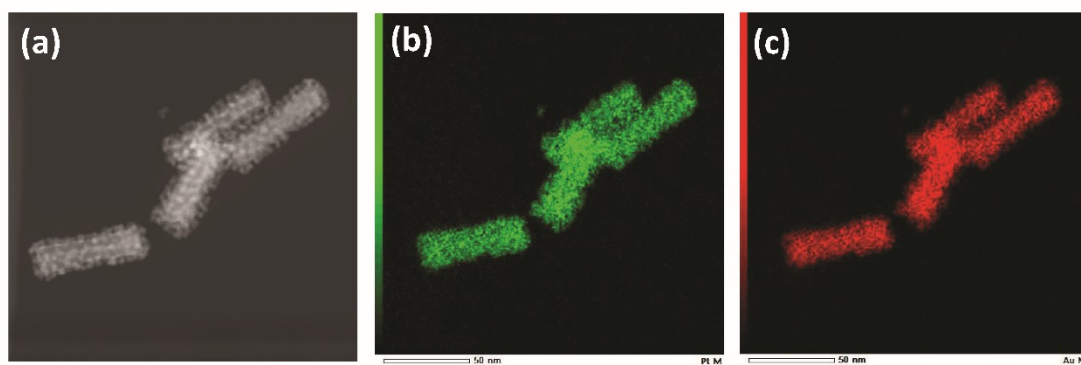
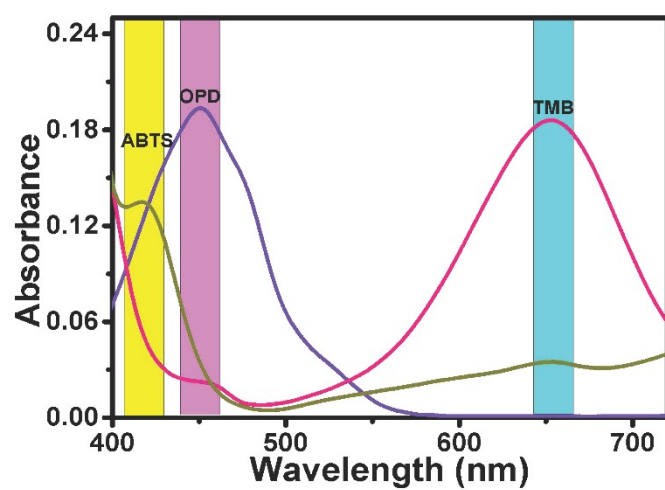***Corresponding Authors:**

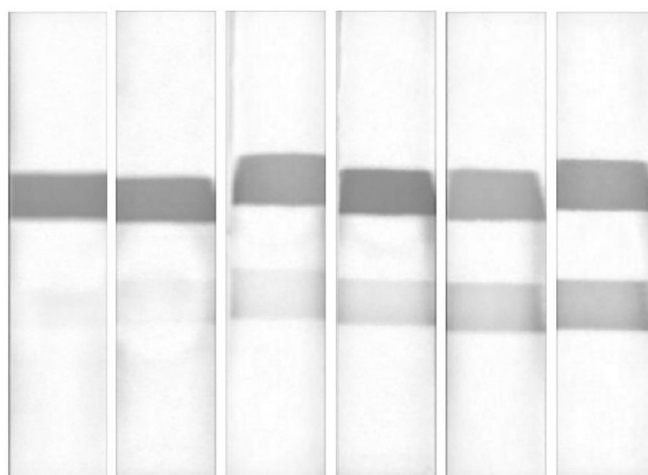E-mail: Wei Wen, wenwei@hubu.edu.cn;

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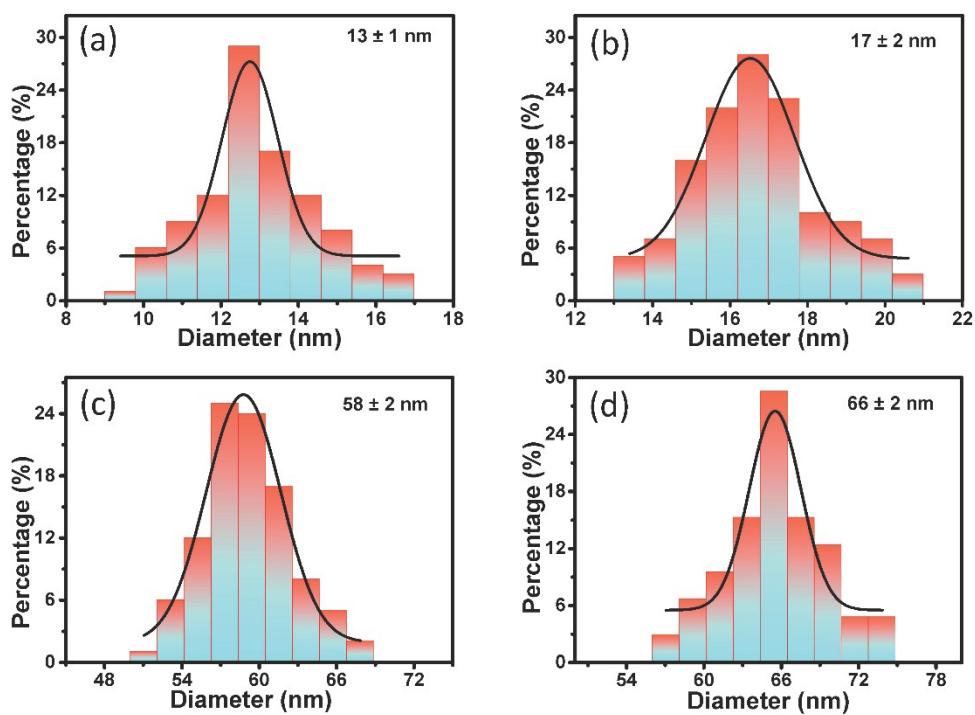
Fig. S1 The width distribution diagram of the AuNRs (a) and Au@Pt nanorods (b); the length distribution diagram of the AuNRs (c) and Au@Pt nanorods (d).
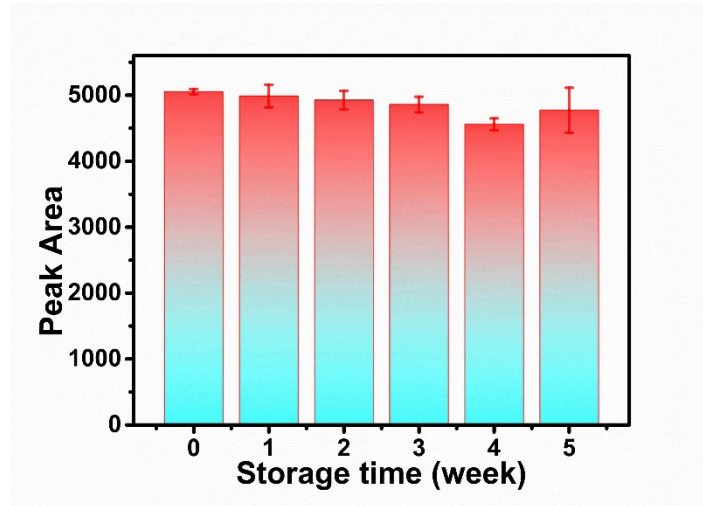
Fig. S2 Elemental mapping images of Au@Pt nanorods: (a) Au@Pt; (b) Pt; (c) Au.

Fig. S3 The UV-vis absorption spectrum of TMB, OPD and ABTS catalyzed by the Au@Pt nanorods.

Fig. S4 The physical map of lateral flow biosensors for the detection of HBV-DNA.

Fig. S5 Effect of storage conditions on lateral flow biosensors for the detection of HBV-DNA.

Table S1 Comparison of this work with other reported methods

Method	Amplification	Linear range	LOD	Reference
Electrochemical	nanoporous gold electrode	0.4 - 10 nM	10 pM	1
Fluorescence signal	Exonuclease III and silver nanoclusters probe	4 - 625 nM	0.97 nM	2
Fluorescence biosensor	hyperbranched rolling circle amplification	0.1 - 40 nM	0.05 nM	3
Lateral flow biosensors	enhanced oxidase-like activity	0.1 - 50 nM	8.5 pM	This work

Table S2 Repeatability of multiple experiments in lateral flow biosensors.

TargHBV concentration (nM)	Intra-assay			Inter-assay		
	Mean[a]	SD[b]	CV[c] (%)	Mean[a]	SD[b]	CV[c] (%)
0.2	1139.01	117.54	10.32	1184.76	117.16	9.86
2	4740.96	262.96	5.55	4665.13	95.73	2.05
20	6058.11	134.15	2.21	6271.04	107.71	1.72

(a) Average value of signal intensity on parallel experimental test line (n=3); (b) standard deviation between parallel test experiments (n=3); (c) (the coefficient of variation) CV=SD/mean.

Table S3 The sequences for the nucleic acids used in this work.

Primer name	Primer sequence (5'to3')
Probe DNA	AAAAAAAAAATACCACATCATCCAT
HBV-DNA	TTGGCTTTCAGTTATATGGATGATGTGGTA
T-DNA	ATAACTGAAAGCCAA
C-DNA	ATGGATGATGTGGTA
Non-complementaryDNA1	TGGAT TGCA ACTT ACGA CAAG CCGC TTGTA
Non-complementaryDNA2	TAATC CGTC AGAT ACCG GAAC CGGA CCGAA
Non-complementaryDNA3	TATAG CCGA CGGA CGGC CCGA GCAA GCCAT

Table S4 Reliability of lateral flow biosensors in detecting HBV-DNA in serum samples.

Sample number	Spiked Concentration (nM)	Measured Concentration (nM)	Recovery (%)
1	2	1.80	90.00
2	10	10.35	103.50
3	20	17.38	86.90

References

1. L. E. Ahangar and M. A. Mehrgardi, Bioelectrochemistry, 2017, 117, 83-88.
2. Z. C. Liu, L. Zhang, Y. M. Zhang, R. P. liang and J. D. Qiu, Sens. Actuators B Chem, 2014, 205, 219-226.
3. X. H. Li, X. L. Zhang, J. Wu, N. Lin, W. M. Sun, M. Chen, Q. S. Ou and Z. Y. Lin, Talanta, 2019, 191, 277-282.