Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supporting Information

PSS-GN nanocomposites as highly-efficient peroxidase mimic and their application to colorimetric detection of glucose in serum

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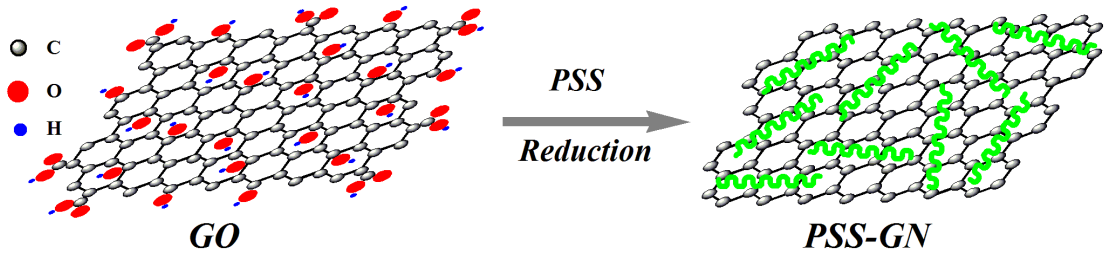
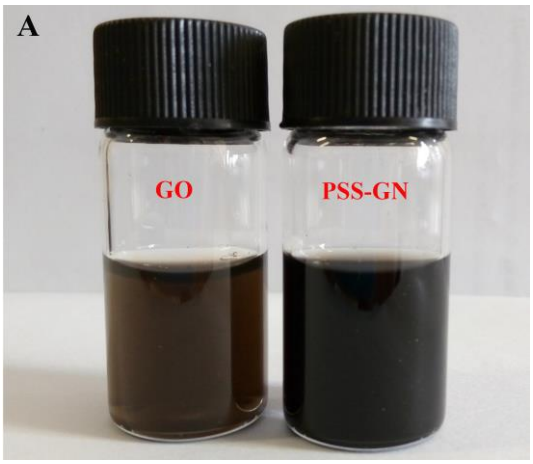
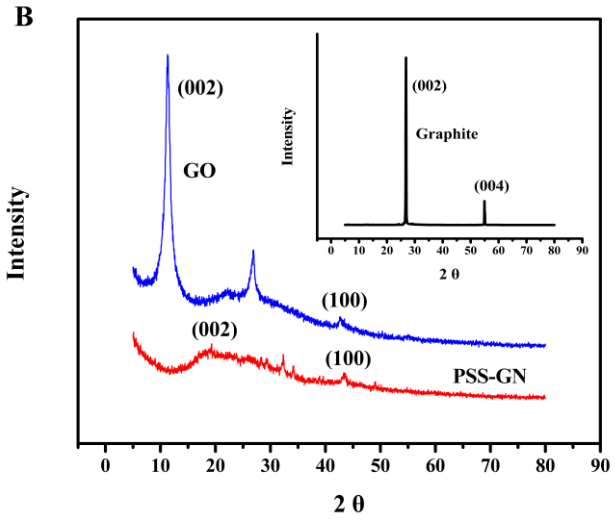
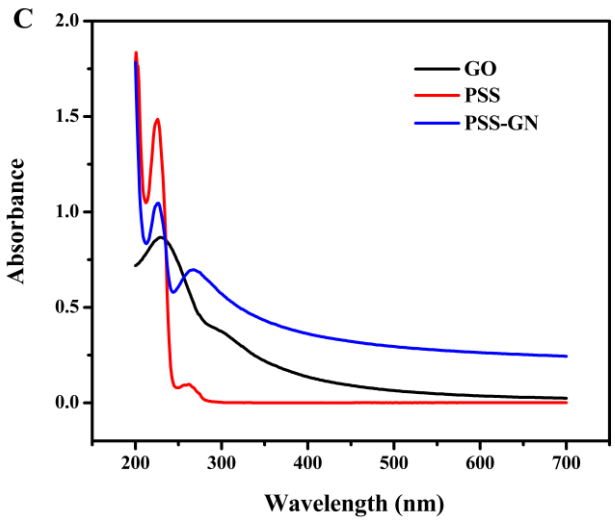
Scheme S1 Schematic illustration of the formation of PSS-GN nanocomposites.




A
GO
PSS-GN


B
Intensity
(002)
GO
(100)
(002)
(100)
PSS-GN
0 10 20 30 40 50 60 70 80 90
2 θ
Intensity
(002)
Graphite
(004)
0 10 20 30 40 50 60 70 80 90
2 θ


C
Absorbance
2.0
1.5
1.0
0.5
0.0
GO
PSS
PSS-GN
200 300 400 500 600 700
Wavelength (nm)

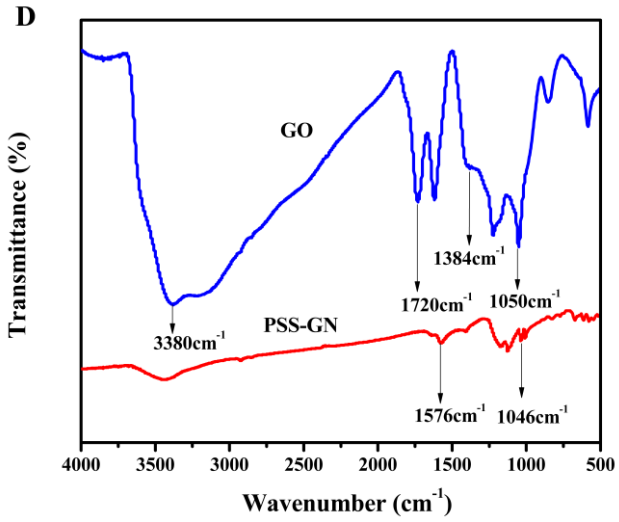


Fig. S1 (A) Photographs of water dispersion of 0.5 mg mL^{-1} GO and 0.5 mg mL^{-1} PSS-GN nanocomposites. (B) XRD patterns of GO and PSS-GN nanocomposites; inset: graphite. (C) UV-vis spectra of GO, PSS, and PSS-GN nanocomposites. (D) FT-IR spectra of the GO and PSS-GN nanocomposites.

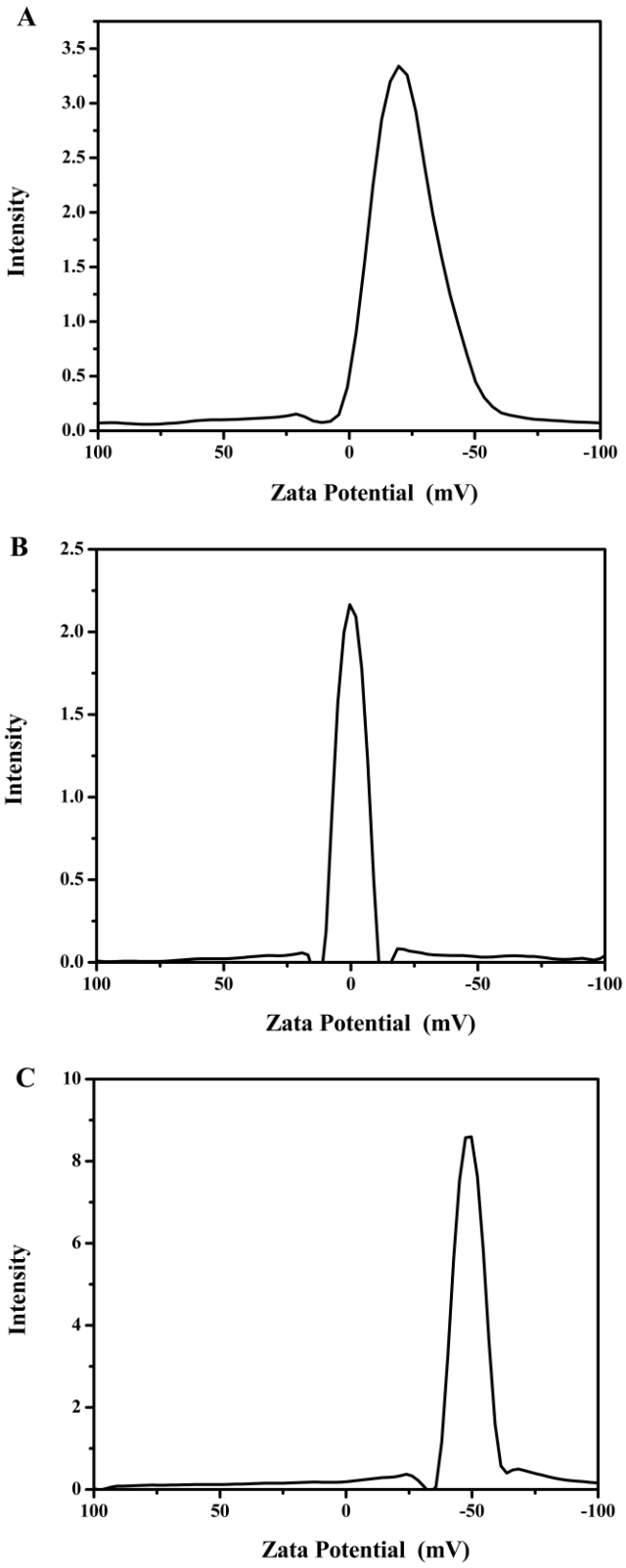


Fig. S2 Zeta potential analysis of GO (A), GN (B) and PSS-GN nanocomposites (C).

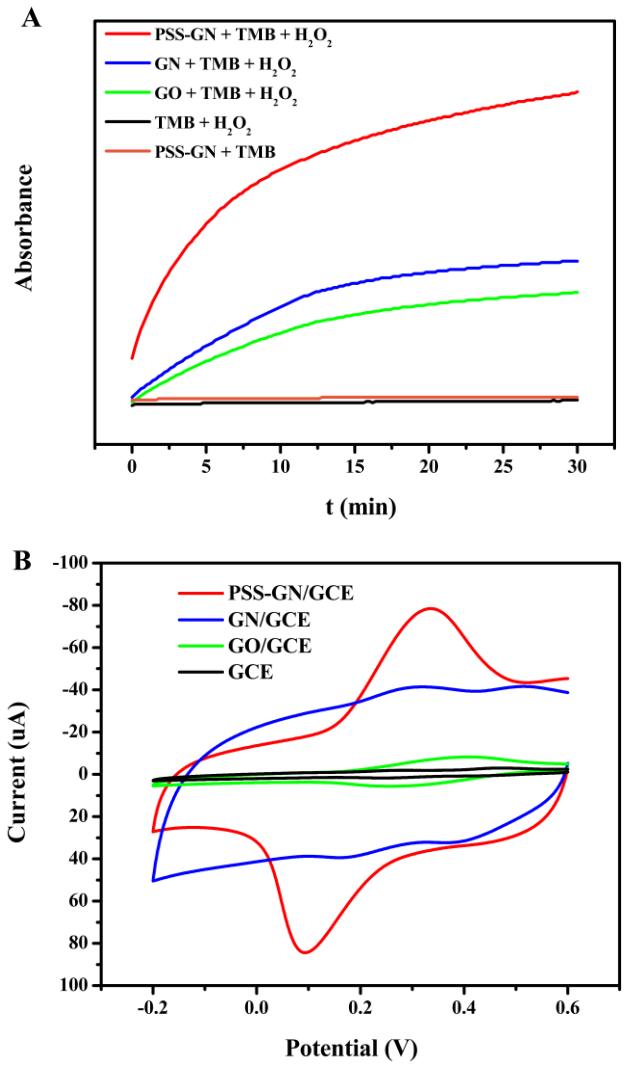
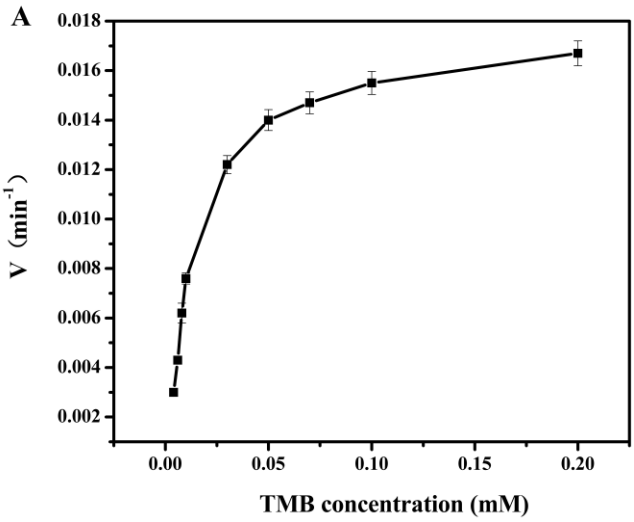
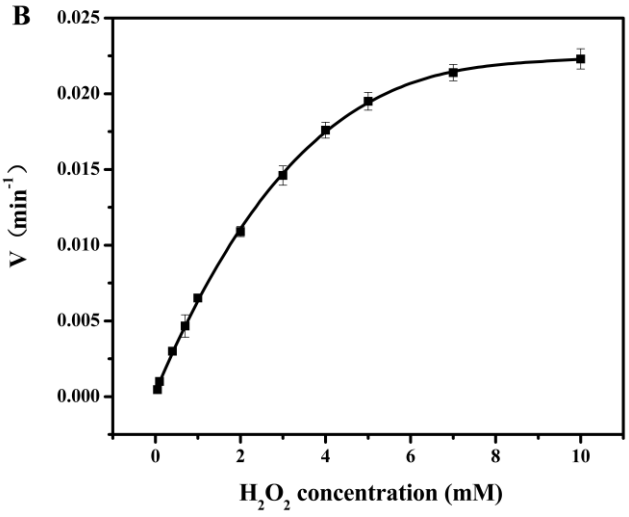
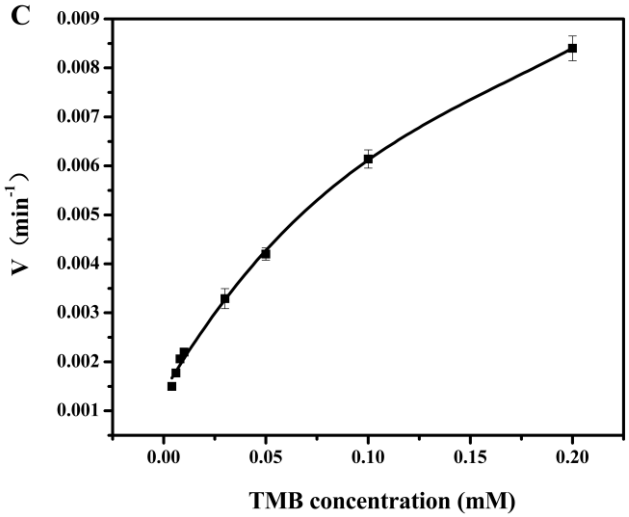


Fig. S3 (A) Time-dependent absorbance changes at 652 nm in different reaction systems. Reaction condition: 15 μg mL^{-1} enzyme mimics (GO, GN or PSS-GN), 0.2 mM TMB and 2 mM H_2O_2. (C) Voltammogram of 16 μM TMB and 20 μM H_2O_2 in 0.1 M HAc-NaAc (pH 4.0) on different electrodes: bare GCE, GO/GCE, GN/GCE and PSS-GN/GCE. Accumulation time: 2 min; scan rate: 100 mV s^{-1}.


A
V（min-1）
TMB concentration (mM)


B
V（min-1）
H2O2 concentration (mM)


C
V（min-1）
TMB concentration (mM)

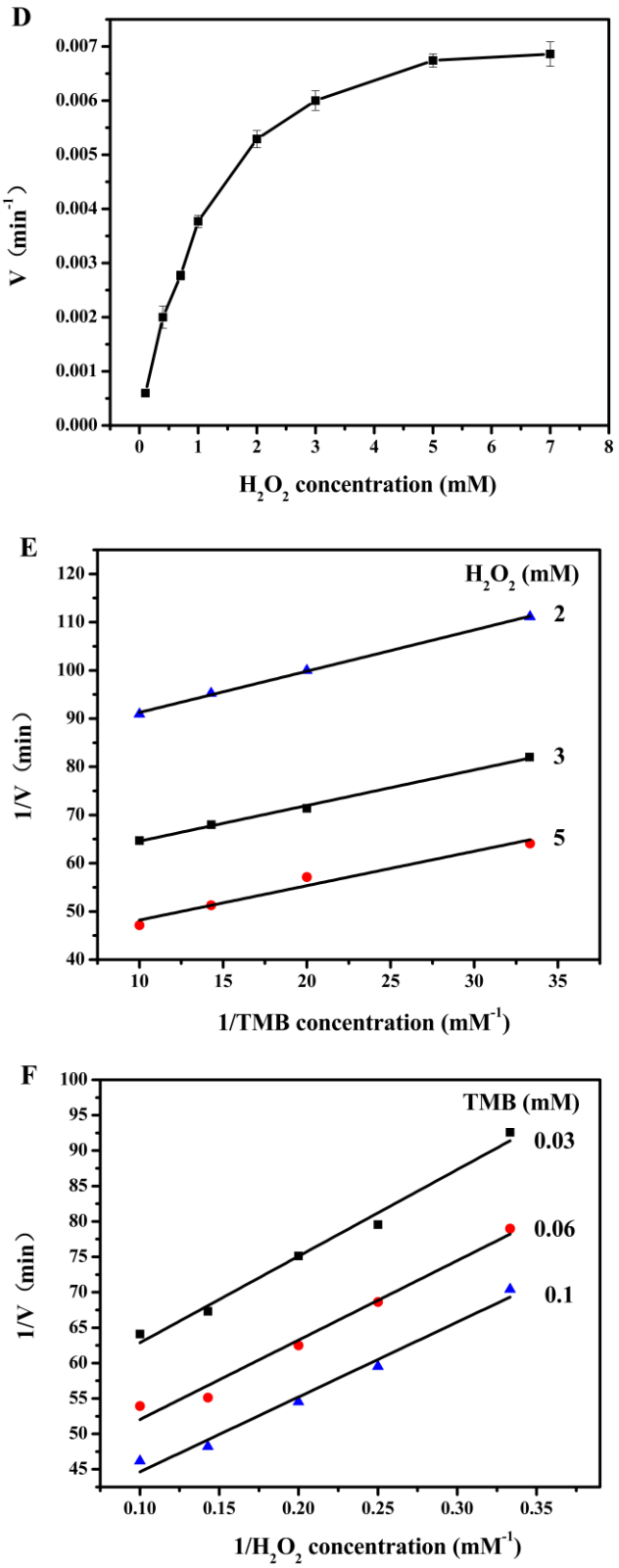


Fig. S4 Steady-state kinetic assay and catalytic mechanism of enzyme mimics

(PSS-GN nanocomposites and GO) (A-D): The velocity (v) of the reaction was measured using 15 μg mL^{-1} PSS-GN nanocomposites (A, B) or 15 μg mL^{-1} GO (C, D). (A, C) The concentration of H_2O_2 was 3 mM and the TMB concentration was varied. (B, D) The concentration of TMB was 0.2 mM and the H_2O_2 concentration was varied. (E and F) double reciprocal plots of activity of PSS-GN nanocomposites with the concentration of one substrate (H_2O_2 or TMB) fixed and the second substrate varied.

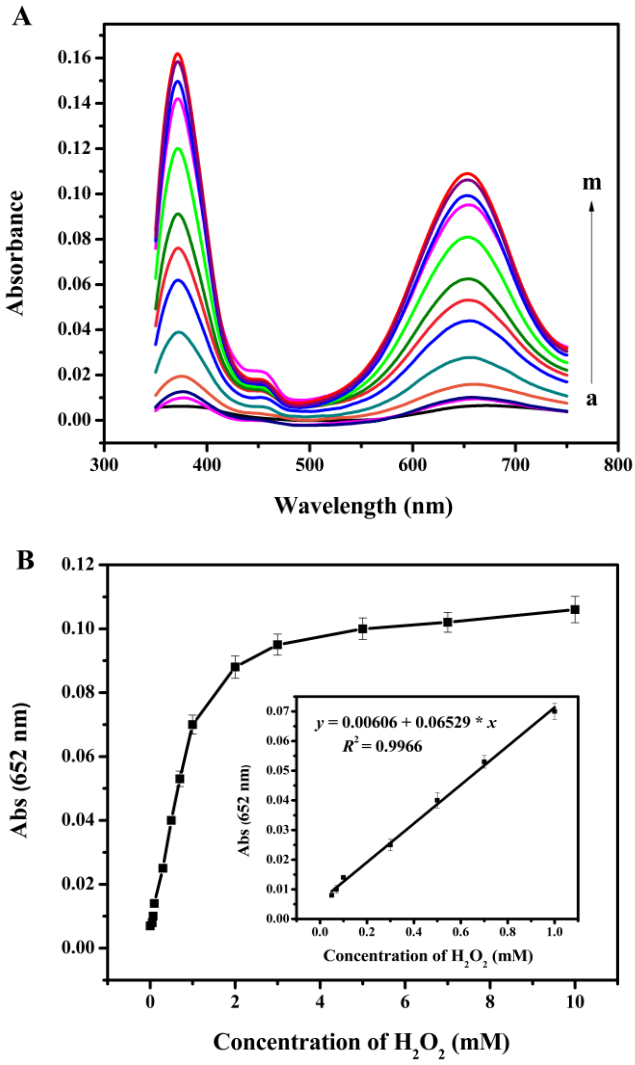


Fig. S5 (A) UV-vis absorption spectra of the TMB/GO solutions in the presence of H_2O_2 at various concentrations (a-m): 0, 0.05, 0.07, 0.1, 0.3, 0.5, 0.7, 1, 2, 3, 5, 7, and 10 mM using GO as an artificial mimetic. (B) The absorbance intensity at 652 nm plotted against the H_2O_2 concentration. The insert shows linear calibration curve between the absorbance at 652 nm and concentration of H_2O_2.

Table 1S Comparison of the apparent Michaelis–Menten constant (Km) and maximum reaction rate (V_{max}) of PSS-GN nanocomposites, GO and HRP.

Catalyst	K_m (mM)		V_{max} (10^{-8} M s^{-1})		Ref.
	TMB	H_2O_2	TMB	H_2O_2	
PSS-GN	0.015	2.06	30.2	35.5	This study
GO	0.049	3.62	17.6	6.18	This study
HRP	0.43	3.7	10	8.71	1
$C_{60}[C(COOH)_2]_2$	0.23	24.58	34.73	40.11	2
C-Dots	0.039	26.77	3.61	30.61	3
CNPs	0.05	26.06	4.27	6.05	4
N-GQDs	11.19	0.10	0.38	0.14	5
HCNTs	0.020	0.4	-	-	6

Table S2 Comparison of nanomaterials-based methods for the determination of glucose

Nanomaterials	Method	Linear ranges (μM)	LODs (μM)	Refs
Fe_3O_4 magnetic nanoparticles	Colorimetric	50-1000	30	7
TiO_2 nanotubes	Electrochemical	400-3600	5	8
PEI/{GOD/PEI}$_3$/CNT	Electrochemical	0-300	50	9
RGO/HAp/GOx	Electrochemical	100-11500	30	10
WS_2 nanosheets	Colorimetric	5-300	2.9	11
$ZnFe_2O_4$ Nanoparticles	Colorimetric	1.25-18.75	0.3	12
Magnetic mesoporous carbon	Electrochemical	500-10000	200	13
PVA/GQD	Fluorescence	250-24000	10	14
Carbon nanodots	Colorimetric	1-500	0.4	3
Nitrogen-doped graphene Quantum dots	Colorimetric	25-375	16	5
Carbon nitride dots	Colorimetric	1-5	0.5	15
Graphene dots	Colorimetric	0.5-200	0.5	16
g-C_3N_4	Electrochemical	1000-12000	11	17
PEDOT/GO nanocomposite	Electrochemical	0.1-1300	0.047	18
GCNT-Fe3O4 nanocomposite	Electrochemical	50-5000	22	19
GO–Fe_3O_4 nanocomposites	Colorimetric	2–200	0.74	20
Co_3O_4/rGO nanocomposites	Colorimetric	1-100	1	21
Fe-Phen-CFs composite	Fluorescence	0.5-200	0.19	22
Molecular beacons	Fluorescence	10-1000	2	23
PSS-GN nanocomposites	Colorimetric	6-400	0.28	this work

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