Electronic Supplementary Information (ESI)

A novel fluorescent concanavalin A detection platform using anti-concanavalin A aptamer and graphene oxide

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Experimental Section

Materials and chemicals

HPLC purified FAM-ssDNA used in this work were synthesized by Sangon Biotech Co., Ltd. of China (Shanghai, China). The sequence of the 41-mer DNA aptamer: 5'-(6-FAM) - CGAGTAACGCTGTCTCTTCCGAATCGGGGGAAGGCGGAGGG-3'. Newborn cattle serum was obtained from Sangon Biotech Co., Ltd. of China (Shanghai, China). Tris (hydroxymethyl) aminomethane (Tris), trypsin, pepsin, lysozyme (Lys), concanavalin A (ConA) were obtained from Sigma-Aldrich. Graphene oxide (GO) was purchased from Nanjing XFNANO Materials Tech Co. (Nanjing, China). All other chemical reagents were of analytical reagent grade and used as received without further refinement. A 20 mM Tris–HCl buffer (pH 7.2) containing 120 mM NaCl, 5 mM KCl, 1 mM $MgCl_2$ and 1 mM $CaCl_2$ was employed. Ultrapure deionized water was used throughout all the experiments.

Apparatus and Measurements

All fluorescence measurements were performed on a F-2500 fluorescence spectrometer (Hitachi, Japan) at the excitation wavelength of 481 nm and fluorescence data were recorded from 500 nm to 600 nm. Both the excitation and emission slit widths were set at 10 nm and the PMT detector voltage was 700 V. Fluorescence anisotropy was measured using a LS 55 fluorescence spectrometer (PerkinElmer, American) with an excitation wavelength at 481 nm and an emission wavelength at 518 nm. FTIR spectrum was recorded using a FTIR-650 spectrometer (Tianjin Gangdong).

Procedures of ConA detection

The working oligo aptamer solutions were obtained by adequate dilution of the stock solution of 100 μM in Tris–HCl buffer and stored at -20℃. Appropriate concentrations of aptamer solutions (10 nM) and different concentrations of ConA solutions were mixed well and then incubated for 40 min at room temperature. Then GO was added into the solution to make the final volume 1 ml. The final concentration of GO was 20 μg ml^{-1}. After the mixture was incubated for 10 min, the fluorescence emission spectra were recorded. All experiments were repeated three times.

The stability of the sensor

The stability of the biosensor in storage was investigated. When the ConA sensor prepared was sealed and stored in the refrigerator (4 °C), the fluorescence intensity was measured every three hours. The result was shown in Fig. s4.

Supplementary Figures

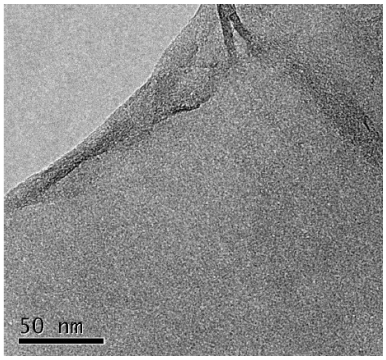

Fig. s1 The TEM image of GO.

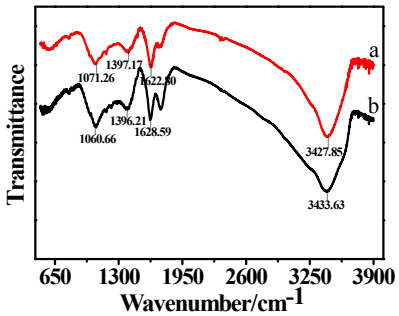

Fig. s2 The FTIR spectra of GO and FCA/GO.

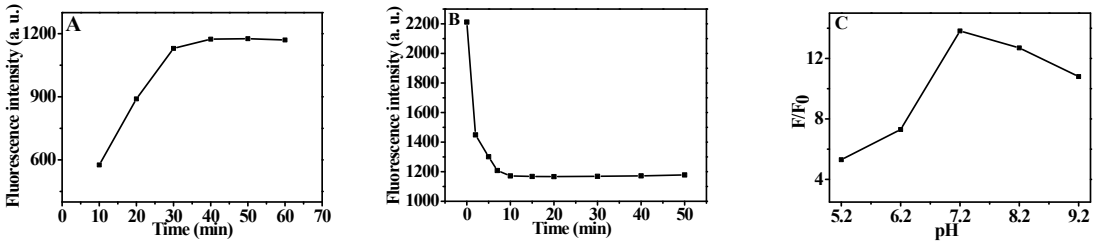

Fig. s3 Influence of the relevant experimental factors on the fluorescence intensity of sensing system. (A) incubation time between FCA and ConA, (B) incubation time between FCA and GO, (C) pH (F_0 and F refer to the fluorescence intensity of sensing system at different pH values in the absence or the presence of Con A, respectively). FAM-ssDNA for A−C, 10 nM; ConA for A−C, 200 nM; GO for A−C, 20 μg mL^{-1}.

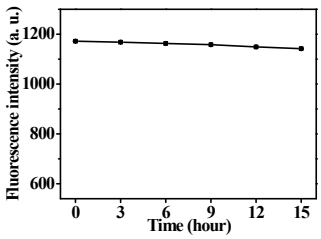

Fig. s4 The stability of the sensor. Concentrations of FCA, ConA and GO are 10 nM, 200 nM and 20 μg ml^{-1}, respectively. The excitation wavelength is 481 nm.

Table s1 Performance comparison of this work with other methods for concanavalin A detection.

Methods	**Sensor strategy**	**Liner range**	**Detection limit**	**Detection time**	**Ref.**
Fluorescence	Aptamer/GO	400 pM–160 nM	0.87nM	50min	This work
Fluorescence	Trityl-derivatized mannoses/microplate	0–117.6 nM	117.6 nM	Not reported	1
Fluorescence	Glucosamine/quantum dots/GO	9.8–196.1 nM	3.3 nM	~2h10min	2
Fluorescence	Glucosamine/quantum dots	0.4−46 nM	0.3nM	~4h35min	3
UV-visible spectroscopy	Mannose/Gold Nanoparticles	192–385 nM	Not reported	~9h	4
Electrochemistry	Daunomycin/surfactant	2.0–80 nM	1nM	1h5min	5
Electrochemistry	$NiCo_2O_4$/graphene	0.49–4.9 pM	0.166 pM	~26h20min	6
Electrochemistry	Glycolipid/alkanethiol vesicles	2.45–98 nM	2.45 nM	~12h	7
Electrochemistry	Glucosamine/DNA-conjugated magnetic bead	1.96 pM–98 nM	1.5 pM	~17h45min	8
Surface plasmon resonance	Dextran/gold nanoparticles /GO	9.8–196.1 nM	3.8 nM	~6h2min	9

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