# Supporting Materials

## Electrogenerated chemiluminescence resonance energy transfer between $ZnGa_2O_4$/g-$C_3N_4$ and gold nanoparticles/graphene and its application in the detection of thrombin

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**Electrochemical and ECL measurements.** The electrochemical measurements were recorded with CHI 660D electrochemical workstation (CH Instruments Co., China). A conventional three-electrode system was adopted, including a modified GCE as the working electrode, a platinum wire as the counter electrode and a saturated calomel electrode (SCE) as the reference electrode, respectively. Electrochemical impedance spectroscopy (EIS) was carried out at open circuit potential in 0.1 mol $L^{-1}$ KCl solution containing $K_3[Fe(CN)_6]/K_4[Fe(CN)_6]$ (5 mM, 1:1). The frequency range was selected as 0.01 Hz-100 kHz, and potential amplitude was 5 mV. The ECL measurement was carried out on a model MPI-M electrochemiluminescence analyzer (Xi'An Remax Electronic Science & Technology Co. Ltd., China) at room temperature, and the voltage of the photomultiplier tube (PMT) was set at -800V during the detection. A commercial 5 mL cylindroid glass cell was used as ECL cell and was placed directly in front of the PMT.

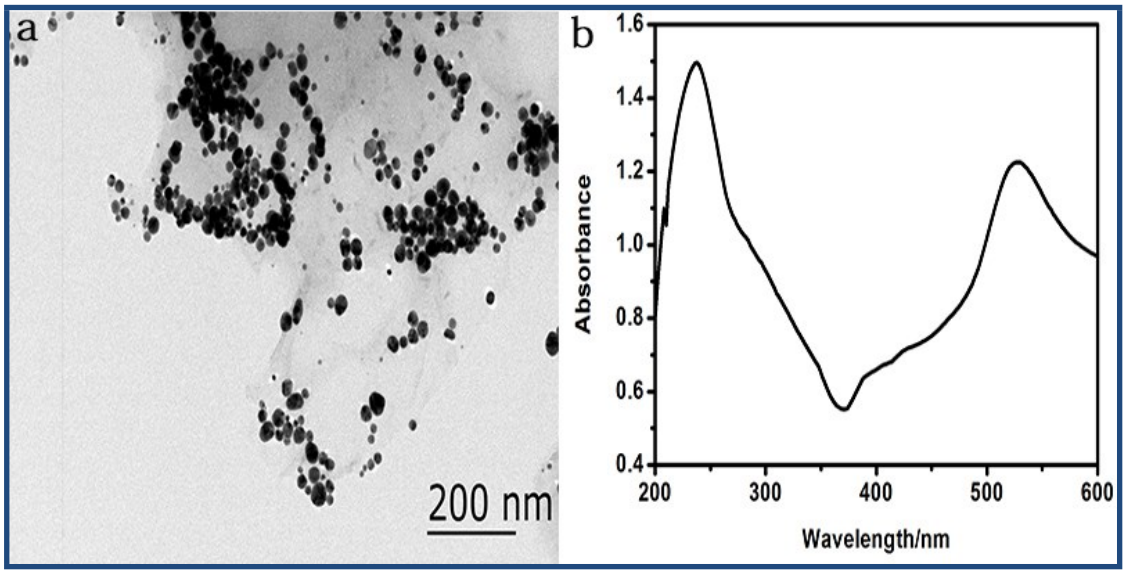


**Fig.S1** TEM image (a) and UV-vis absorption spectrum (b) of gold nanoparticles/graphene composite

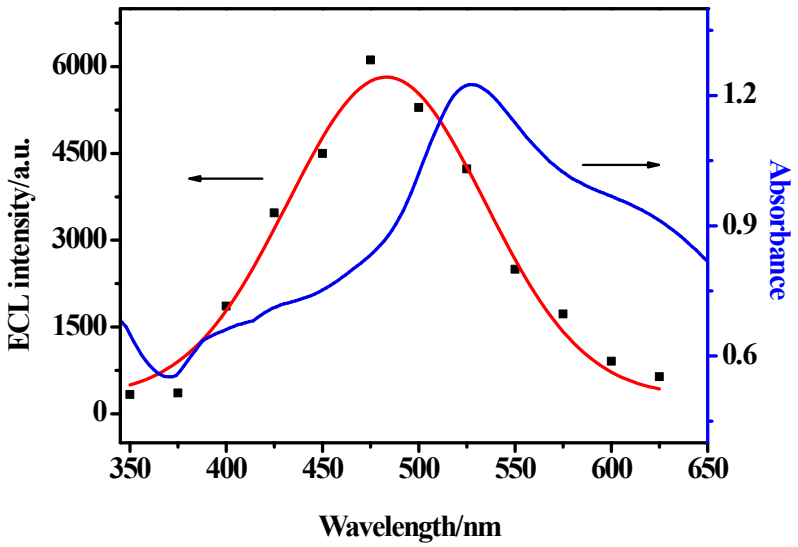


**Fig.S2** ECL spectrum of $ZnGa_2O_4$/g-$C_3N_4$ nanocomposites and UV-vis absorption spectrum of gold nanoparticles/graphene nanocomposites.

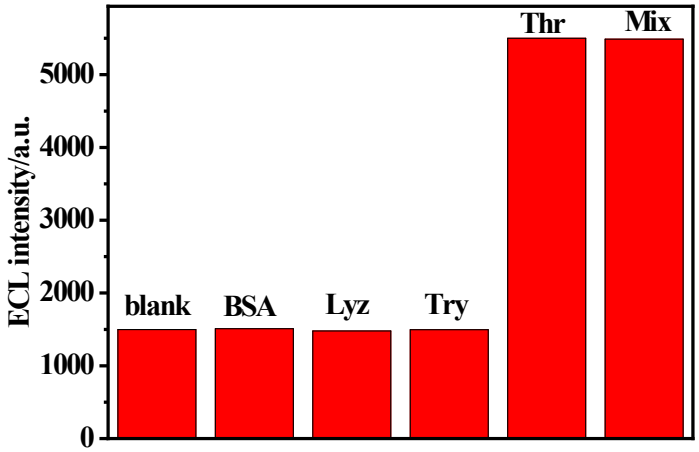


**Fig.S3** Selectivity of the fabricated sensor.

**Table S1** Comparison of different ECL biosensors for the detection of thrombin.

| ECL system | Linear range (pM) | Detection limit (pM) | Ref. |
|---|---|---|---|
| CdTe QDs-$S_2O_8^{2-}$ | 0.5 -800 | 0.35 | 1 |
| $Ru(phen)_3^{2+}$-TPA | 0.05 -50 | 0.02 | 2 |
| $Ru(bpy)_3^{2+}$-TPA | 0.05 -100 | 0.008 | 3 |
| $Ru(bpy)_3^{2+}$-TPA | 0.90 -226 | 0.40 | 4 |
| Luminol-$H_2O_2$ | 5-50000 | 1.7 | 5 |
| Luminol-QDs | 0.01-100 | 0.0014 | 6 |
| Pd NCs-TPA | 0.01-100 | 0.00676 | 7 |
| RuAg/$SiO_2$NPs | 0.002-2 | 0.001 | 8 |
| $ZnGa_2O_4$/g-$C_3N_4$ | 0.00137-27.4 | 0.00055 | This work |


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