Supporting Information

Enantioselective Recognition and Detection of Cysteine Using a Three-Dimensional Mn$_{1/3}$Zn$_{2/3}$CO$_3$-rGO/CNT Heterostructure-Based Molecularly Imprinted Sensor

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1 Materials and instruments

L-cysteine (L-Cys) and D-cysteine (D-Cys) were purchased from Sigma-Aldrich (St. Louis, USA). Carbon nanotubes (CNTs), polypyrrole (PPy), manganese sulfate ($MnSO_4 \cdot H_2O$), zinc sulfate ($ZnSO_4 \cdot 7H_2O$), sodium bicarbonate ($NaHCO_3$), ethylene glycol ($C_2H_4O_2$), sodium chloride (NaCl), potassium dihydrogen phosphate dihydrate ($KH_2PO_4 \cdot 2H_2O$), dipotassium hydrogen phosphate dodecahydrate ($KH_2PO_4 \cdot 12H_2O$), ethanol (C_2H_5OH), and mercuric nitrate ($Hg(NO_3)_2$) were purchased from Sinopharm Chemical Reagent Co., Ltd. (Beijing, China). Hydrochloric acid (HCl), potassium ferricyanide ($K_3[Fe(CN)_6]$), and potassium ferrocyanide ($K_4[Fe(CN)_6]$) were purchased from Aladdin Biochemical Technology Co., Ltd. (Shanghai, China). All chemical reagents were AR grade and used as received. The ultrapure water (resistivity $\geq$ 18.3 M$\Omega \cdot$cm) was used for the preparation of solution.

All instruments and equipment used in this study are listed as follows. Electrical signals were monitored using an Agilent 34465A digital multimeter (Agilent Technologies, USA). The electrochemical measurements were performed using a CHI-760B electrochemical workstation (Shanghai Chenhua Instrument Co., Ltd., China). A Nova Nano SEM 230 field-emission scanning electron microscope (FEI Ltd., USA) and a Tecnai G2 F20 S-TWIN TMP field-emission transmission electron microscope (Thermo Fisher Scientific Co., Ltd., USA) was employed for material morphological characterization. Ultrasonic treatment was carried out using a KQ3200B ultrasonic cleaner (Kunshan Ultrasonic Instrument Co., Ltd., China).
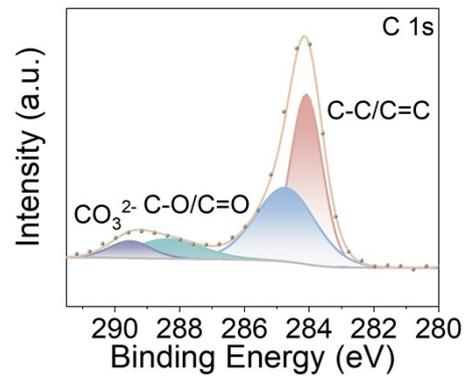
2 Figures

Fig. S1 High-resolution XPS C 1s spectrum of $Mn_{1/3}Zn_{2/3}CO_3$-rGO.
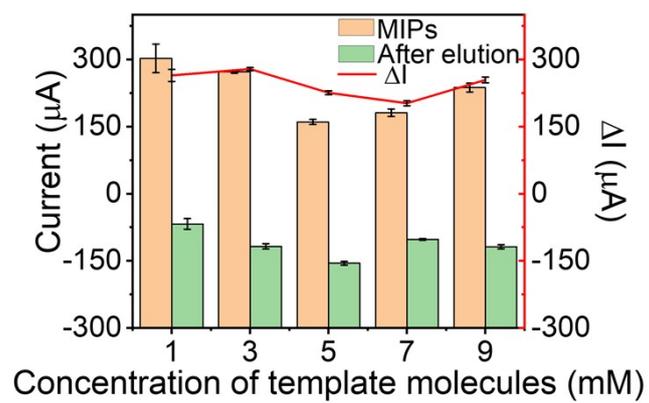
Fig. S2 Effect of temple molecule cysteine concentration.
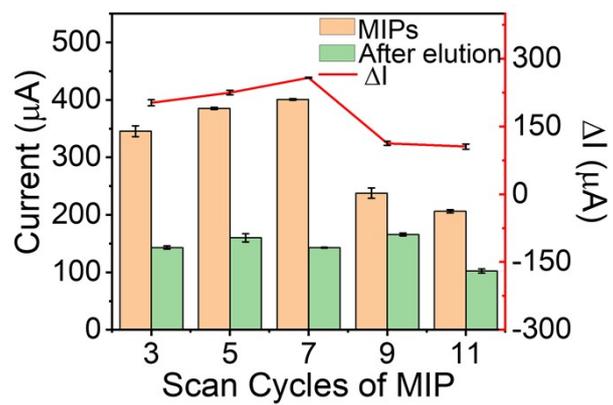
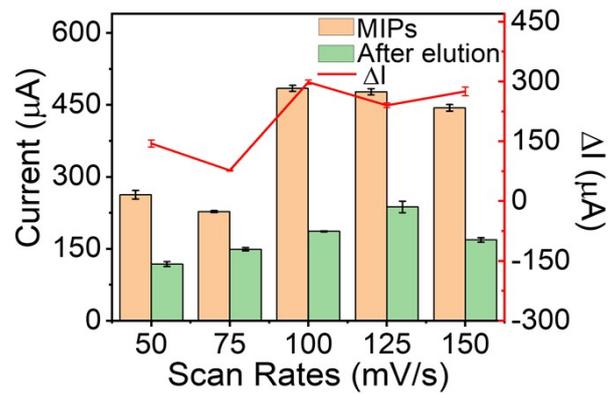**Fig. S3** Effect of electropolymerization scan cycles.

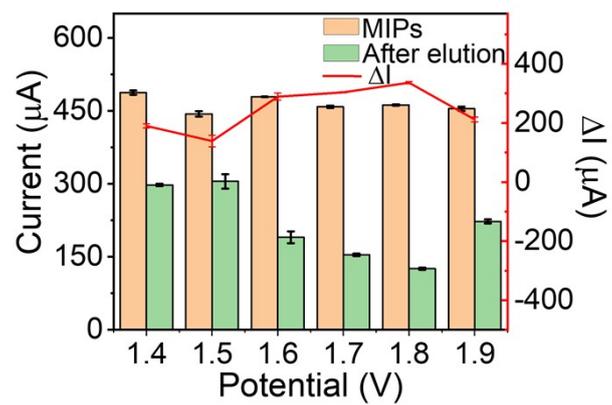**Fig. S4** Effect of the electropolymerization scanning rate.

Fig. S5 Influence of template removal potential on current pre- and post-elution.
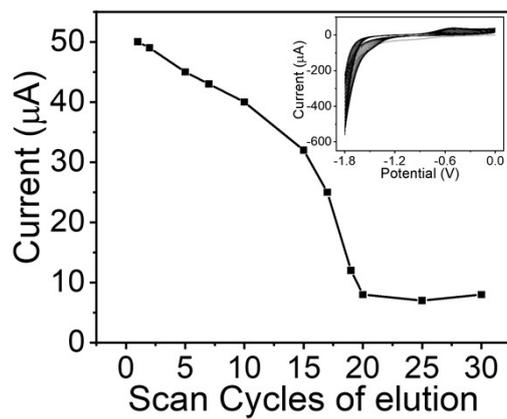
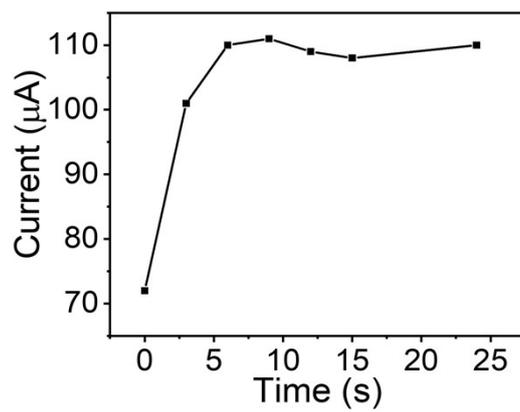**Fig. S6** Scan cycle dependence of peak current during template removal.

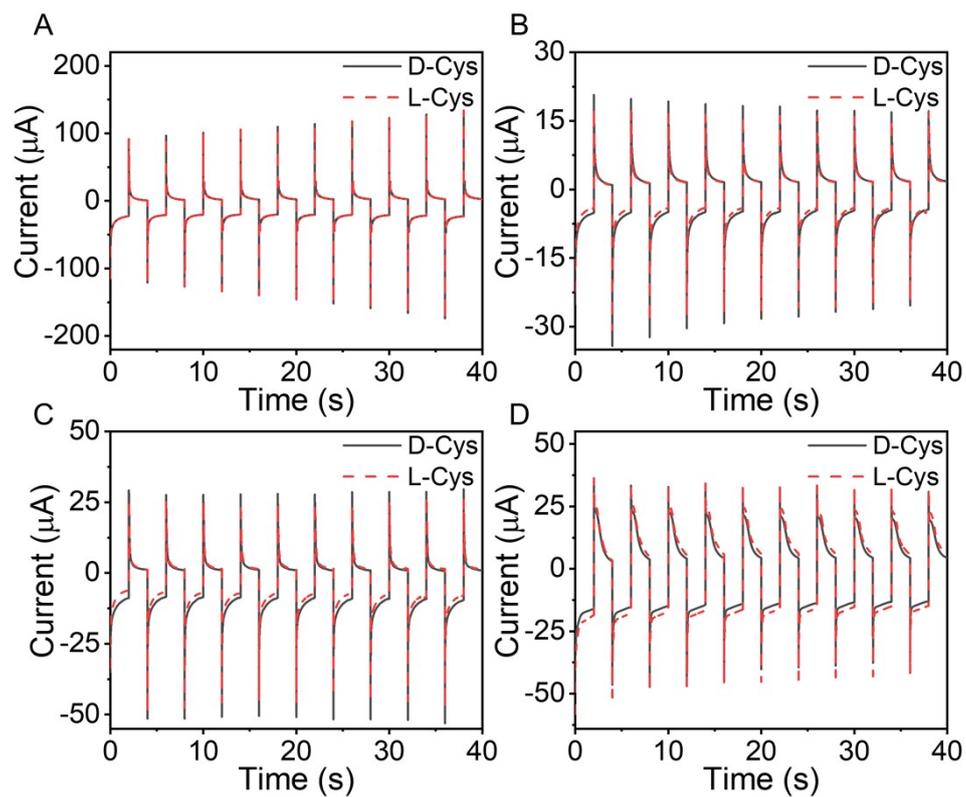**Fig. S7** Rearrangement time of template cysteine molecule.

Fig. S8 Comparison of the recognition ability of different electrodes for L-Cys and D-Cys (A: GCE, B: CNTs/GCE, C: $MnCO_3$-CNTs/GCE, D: $Mn_{1/3}Zn_{2/3}CO_3$-rGO-CNTs/GCE).