

## Supporting Information

### **A label-free electrochemical aptasensor based on Bi–Sb alloy materials for potential POCT of HER-2**

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## 1. Synthesis of Bi–Sb alloy materials

Bi-Sb alloy materials (Bi-Sb AMs) were synthesized using a simple isothermal technique<sup>1</sup>. First, benzenetricarboxylic acid (H<sub>3</sub>BTC, 200 mg, 0.95 mmol) and BiI<sub>3</sub> (100 mg, 0.17 mmol) were dissolved in the mixture solution of DMF (7 mL) and ethanol (7 mL) with sonication in a 25 mL round bottom flask. The mixture was sealed and heated in vacuum drying chamber at 100 °C for 15 h. After being cooled down to room temperature, colorless crystals were obtained. The unreacted substance inside was removed by extensive solvent exchange. Typically, the crystals were washed with dichloromethane for 3 times and then immersed in dichloromethane for 48 h, during which the solvent was repeatedly decanted and replenished. Then, the crystals were immersed in ethanol for 48 h, and the solvent was replenished for several times. After the solvent was removed under vacuum at 80 °C for 12 h, the activated crystals were obtained. Then, 200 mg of the above crystals were completely dispersed in 5 mL ethanol by sonication and 42.61 mg of antimony potassium tartrate was dissolved in 5 mL deionized water. This two solutions were mixed and stirred for 12 h at room temperature. Finally, Bi–Sb AMs was obtained by removing the solvent under vacuum at 150 °C for 12 h.

Before use, the prepared Bi-Sb AMs was ultrasound to form the uniform suspension. Then 20 μL uniform suspension were dropped onto the SPE surface. The morphology of the Bi-Sb AMs on the electrode surface was shown in Fig. S1.



**Fig. S1.** (a) EDS of Bi-Sb AMs, (b) and (c) SEM of SPE surface modified by Bi-Sb AMs.

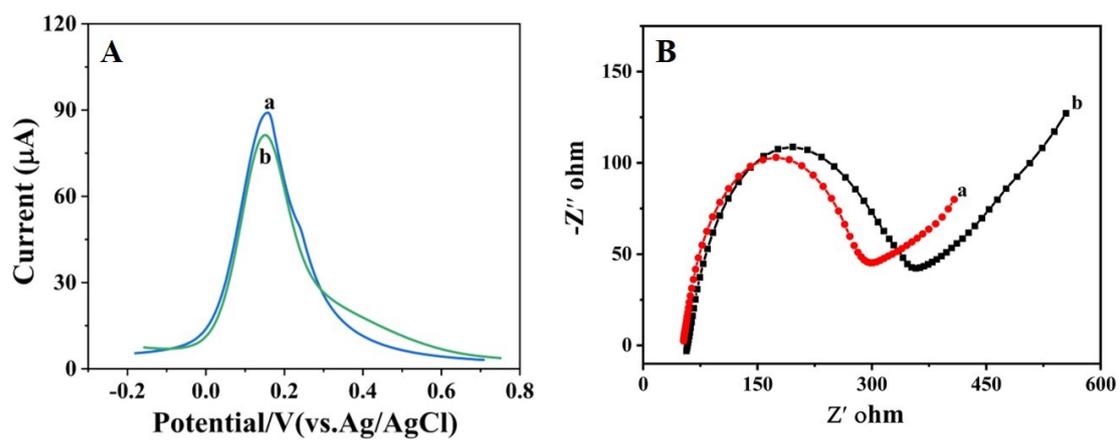
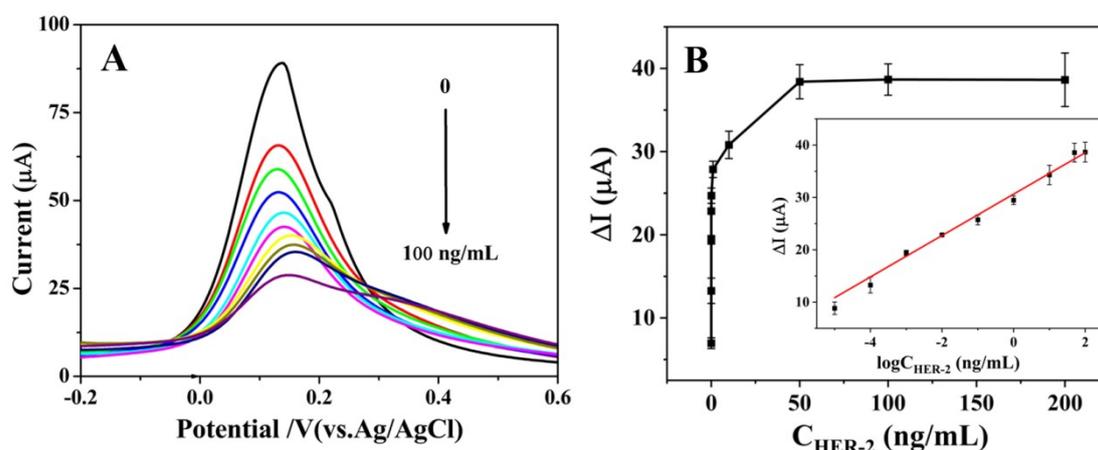


Fig. S2. DPV (A) and EIS (B) of  $[\text{Fe}(\text{CN})_6]^{3-/4-}$  on Bi-Sb AMs/SPE (a) and Bi Ms/SPE (b).

## 2. HER-2 detection with electrochemical station

Under the optimal experimental conditions, the DPV response of the aptasensor to different HER-2 concentrations was measured by the CHI660E electrochemical workstation (Shanghai CH Instrument Co., China). The DPV current of  $[\text{Fe}(\text{CN})_6]^{3-/4-}$  gradually decreased with increasing the concentration of HER-2 due to the poor conductivity and steric hinderance of HER-2 (Fig. S3A). Fig. S3B presents the corresponding calibration plot. The peak current difference  $\Delta I$  exhibited a good linear correlation with the logarithmic of HER-2 concentrations in the range from 0.01  $\text{pg} \cdot \text{mL}^{-1}$  to 100  $\text{ng} \cdot \text{mL}^{-1}$  and the linear regression equation was  $\Delta I = 3.57 \log C_{\text{HER-2}} + 28.75$  with a correlation coefficient of 0.994, and the detection limit (LOD) was calculated to be 6.11  $\text{fg} \cdot \text{mL}^{-1}$ .



**Fig. S3.** (A) DPV responses of the aptasensor for different concentrations of HER-2 in 0.1 M KCl containing 10 mM  $[\text{Fe}(\text{CN})_6]^{3-/4-}$ . (B) Corresponding calibration curve between  $\Delta I$  and logarithm of the concentration of HER-2. Inset is the curve between  $\Delta I$  and the HER-2 concentration. The data were obtained from the CHI 660E.

**Table S1.** Comparison of various electrochemical methods toward detection of HER-2.

Methods	Electrode modification	Linear range (ng • mL <sup>-1</sup> )	Detection limit (pg • mL <sup>-1</sup> )	References
Electrochemistry	MIP <sup>a</sup> /SPE	10 - 70	1600	2
Electrochemistry	MIP <sup>a</sup> /SPE	1 - 200	430	3
Electrochemical immunosensor	MWCNT <sup>b</sup> /AuNPs/SPE	7.5 - 50	160	4
Electrochemical immunosensor	Ag NPs/Au NPs/SPE	0.002 - 12.5	12	5
Electrochemical aptasensor	Dendritic Au/SPE	0.1 - 200	8	6
Electrochemical aptasensor	Au-SPE	0.001 - 100	0.172	7
Electrochemical aptasensor	Bi-Sb AMs/SPE	0.00001 - 100	0.00596	This work

Note:

<sup>a</sup>MIP: molecularly imprinted polymer; <sup>b</sup>MWCNT: multi-wall carbon nanotube

## References

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