Electrochemical Aptasensor Based on ZnO-Au nanocomposites for the Determination of Ochratoxin A in Wine and Beer

Sai Zhang[1], Yahui Wang[2], Qinglin Sheng[*][2], Tianli Yue[*][2]

[1] Key Laboratory of Shaanxi Administration of Traditional Chinese Medicine for TCM Compatibility,

Shaanxi University of Chinese Medicine, Xi'an, Shaanxi 712046, P. R. China

[2] College of Food Science and Technology, Northwest University, Xi'an, Shaanxi 710069, China

[*]**Corresponding authors**: *Email:* qlsheng@nwu.edu.cn; yuetl@nwu.edu.cn.

The peak current dependency with the scan rate before and after the release of MB were investigated. The effect of scan rates over the as-prepared electrode were performed at different sweep rates from 10 to 200 mV/s (Figure S1). The cathodic and anodic peaks over the as-prepared electrode before the release of MB increased with the increase of the sweep rates, indicating a typical surface-controlled process. After release of MB from the as-prepared electrode, the cathodic and anodic peak currents do not increase linearly with the increase of scan rates, but increased linearly with the increase of square root rates, suggesting the electrode reaction is not a surface controlled process but a diffusion-controlled one.
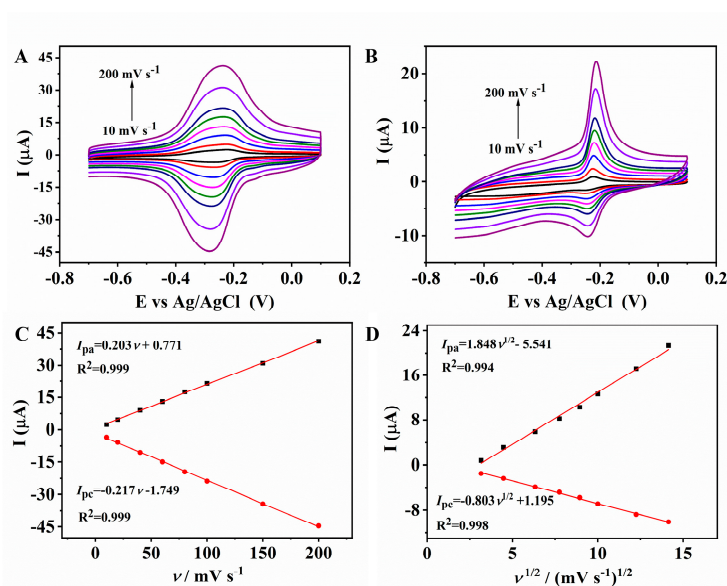

Figure S1. The CV curves at different scanning rates from 10 to 200 mV s^{-1} for the prepared electrode (A) before and (B) after the release of MB. (C) Plots of peak currents vs. scan rates corresponding to (A). (D) Plots of peak currents vs. square root of scan rates corresponding to (B).
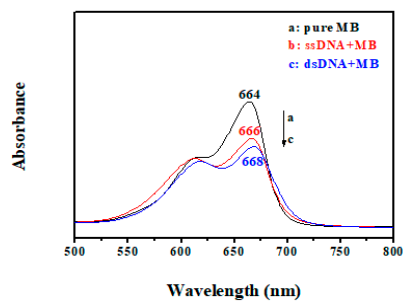
Figure S2. UV-visible absorption spectra of MB: (a) 10 μM pure MB, (b) after incubation with 10 μM MB and 0.5 μM dsDNA, (c) after incubation with 10 μM MB and 0.5 μM ssDNA.
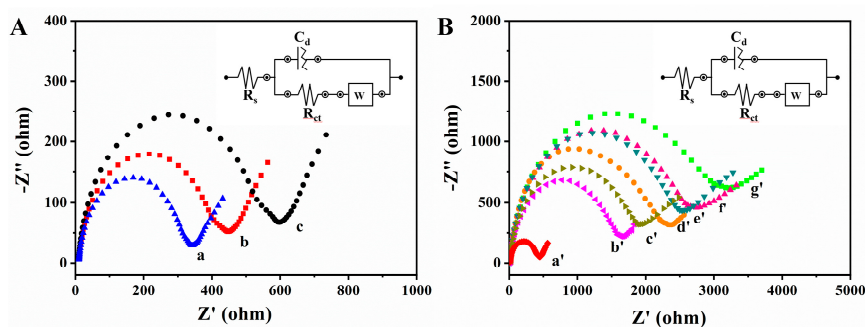

Figure S3. (A) Electrochemical impedance spectroscopy for bare GCE, ZnO-Au/GCE, and ZnO/GCE (a-c) in 1.0 mM $[Fe(CN)_6]^{-3/-4}$ + 0.1 M KCl solution through applying initial potential of 0.27 V vs Ag/AgCl reference electrode and an amplitude of 5 mV in a frequency range of $10^{-2}-10^5$ Hz. The insertion diagram is an equivalent circuit model of the EIS analysis. (B) Electrochemical impedance spectroscopy after each fabrication step recorded: (a') ZnO-Au/GCE, (b') nafion/ZnO-Au/GCE, (c') cDNA/nafion/ZnO-Au/GCE, (d') MCH/cDNA/nafion/ZnO-Au/GCE, (e') OTA/MB/aptamer/(d'), (f') MB/aptamer/(d'), (g') aptamer/(d').
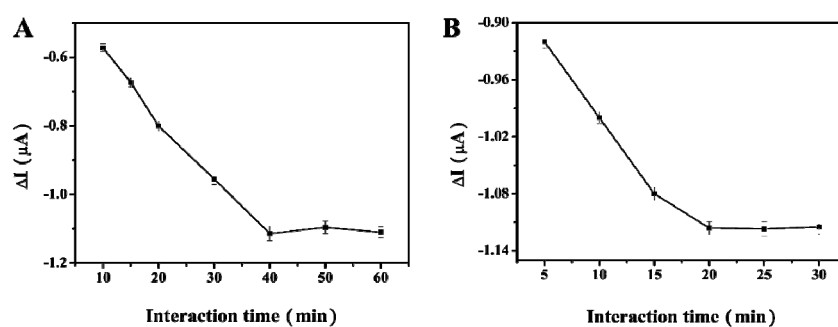
Figure S4. Optimization experiment of (A) incubation time of aptamer/MCH/cDNA/nafion@ZnO-Au/GCE in 20 μM MB and (B) incubation time of MB/aptamer/MCH/cDNA/nafion@ZnO-Au/GCE in 0.1 pg·mL^{-1} OTA.

Table S1. Recovery assay data of electrochemical aptasensor, HPLC and ELISA.

Samples	Spiked OTA (pg·mL^{-1})	Measured (pg·mL^{-1})			RSD (n=5)			Recovery (n=5)		
		Aptasensor	HPLC	ELISA	Aptasensor	HPLC	ELISA	Aptasensor	HPLC	ELISA
Beverage 1	1	1.095	0.986	1.032	3.6%	4.0%	2.7%	109.1%	98.6%	103.2%
	100	105.2	103.8	104.3	3.4%	3.2%	4.2%	105.2%	103.8%	104.3%
Beverage 2	1	1.05	1.02	0.994	3.5%	3.4%	3.1%	104.5%	102.0%	99.4%
	100	106.0	103.4	102.7	4.2%	3.6%	4.8%	106.0%	103.4%	102.7%

Beverage 1: wine; Beverage 2: beer. n: number of measurement.