

Supplementary Information

Multivalent SnO₂ quantum dots-decorated Ti₃C₂ MXene for highly sensitive electrochemical detection of Sudan I in food

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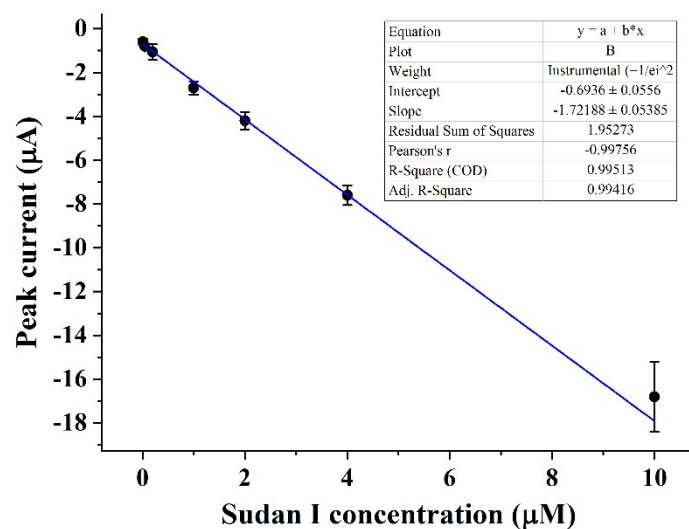


Figure S1. Corresponding calibration curve between the peak current and Sudan I concentration ($n = 3$). (Condition: 250 mM PBS at pH 5.6 under the scan rate of 100 mV/s).

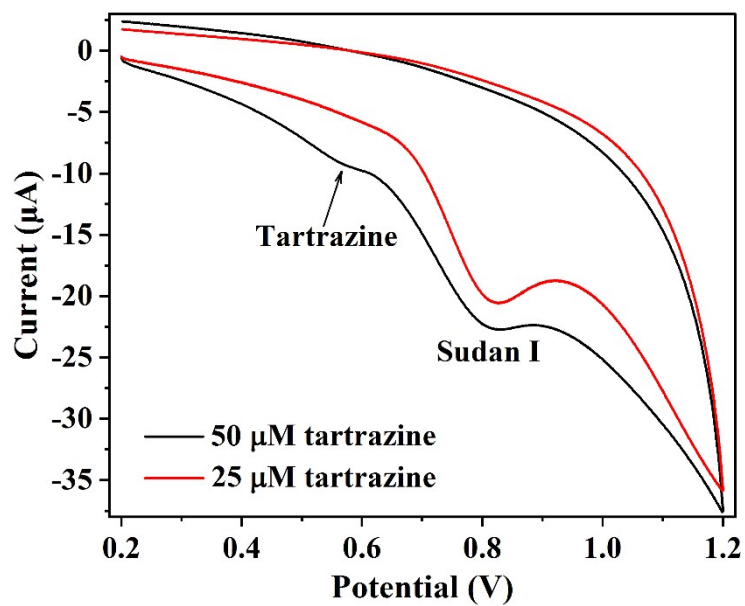


Figure S2. CV curves of 1.0 μM Sudan I with different tartrazine concentration by the $\text{Ti}_3\text{C}_2\text{-SnO}_2\text{QDs/GCE}$ sensor. (Condition: 250 mM PBS at pH 5.6 under the scan rate of 100 mV/s).

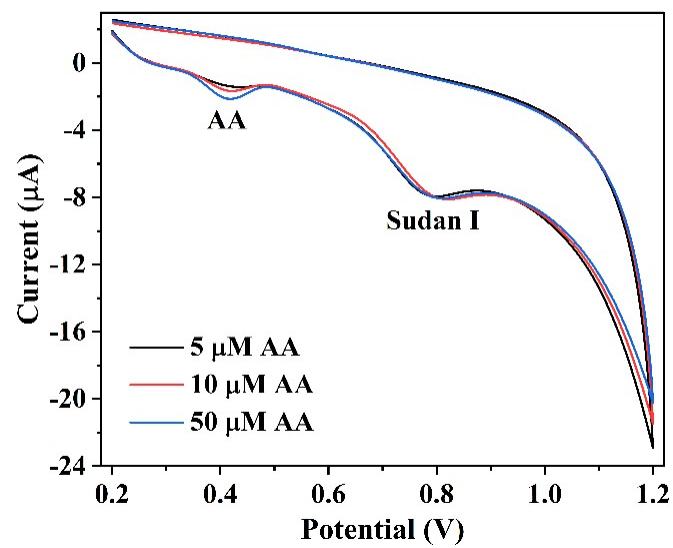


Figure S3. CV curves of 1.0 μM Sudan I with different AA concentration by the $\text{Ti}_3\text{C}_2\text{-SnO}_2\text{QDs/GCE}$ sensor. (Condition: 250 mM PBS at pH 5.6 under the scan rate of 100 mV/s).

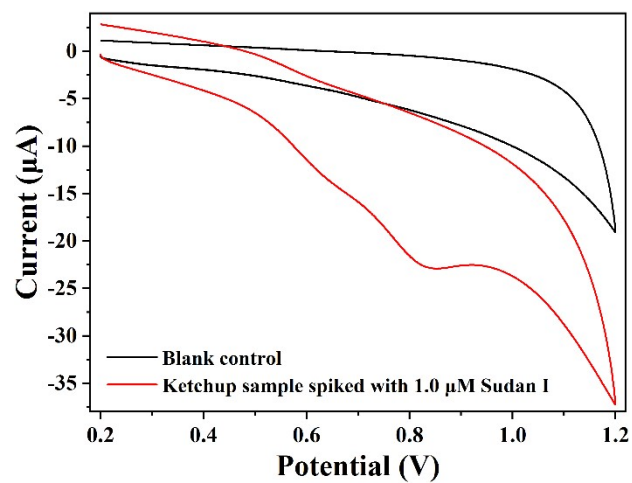


Figure S4. CV curves of the blank control of ketchup sample and the ketchup sample spiked with 1.0 μM Sudan I. (Condition: 250 mM PBS at pH 5.6 under the scan rate of 100 mV/s).

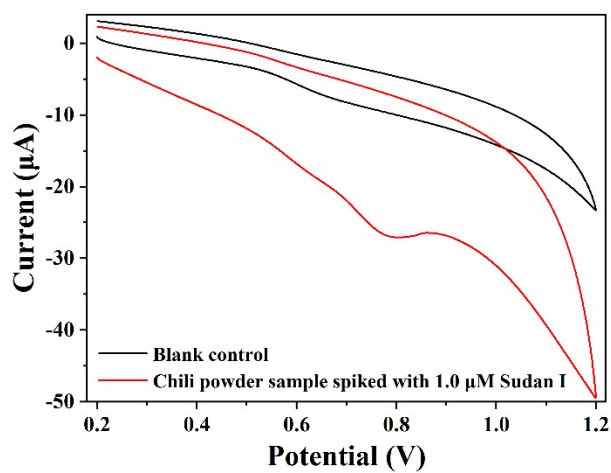


Figure S5. CV curves of the blank control of chili powder sample and the chili powder sample spiked with 1.0 μM Sudan I. (Condition: 250 mM PBS at pH 5.6 under the scan rate of 100 mV/s).

Preparation and UPLC measurement of chili powder sample

The chili powder needs to be further grind before use. 1.0 g of the chili powder sample and appropriate amount of Sudan I were mixed in 10 mL acetonitrile-dichloromethane mixed solution (1:1, v/v). The mixed sample was sonicated for 30 min and centrifuged at 6000 rpm for 30 min. Afterwards, the obtained supernatant was evaporated to dryness and 1.0 mL methanol was added for dissolution. The solution was filtered through a 0.22 μm membrane filters before UPLC measurement.

Liquid chromatographic separation determination was performed on a Vanquish™ UPLC system coupled with TSQ Altis mass spectroscopy (Thermo Fisher Scientific, USA) using an ACQUITY HPLC BEH C18 (2.1 \times 100 mm, 1.7 μm) column with the mobile phase consisting of 0.3% formic acid-water and acetonitrile (3:1, v/v) at a rate of 0.2 mL/min. Multiple reaction monitoring transitions were implemented using 249.2 as precursor ions and 93.1 and 128.1 as fragment ion under positive ion mode.

Table S1. Analytical results of Sudan I content in the chili powder sample.

Spiked Sudan I concentration (μM)	Measured Sudan I content (μM)	
	This method	UPLC-MS method
4.0	4.065	3.457
2.0	2.110	1.604
1.0	1.071	0.8235
0.5	0.5529	0.4268
0.25	0.2537	0.1874
0.1	0.08984	0.07531
0.05	0.04556	0.03686
0.02	0.02578	0.01524

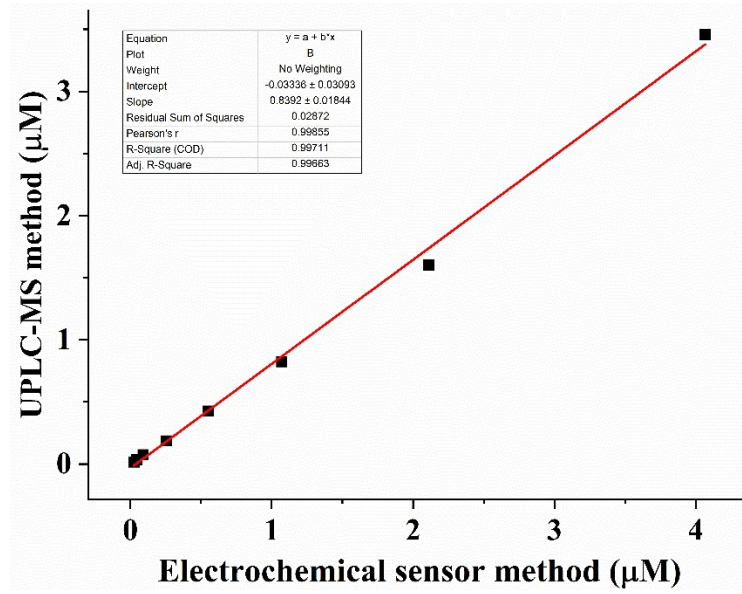


Figure S6. Corresponding calibration curve of Sudan I concentration between the proposed electrochemical sensor and UPLC-MS method.