SUPPORTING INFORMATION

Paper-based colorimetric test strip for arsenic detection in vegetable oil

Contents

Sample preparation for ICP-MS.

A sample mass of 1 g was weighted, mixed with 10 mL of 0.5% HNO_3 and shaken for 3 h in 85°C. Next the solution was centrifuged for 20 min. at 14000 rpm and filtered on syringe filter 0.2 µm and stored at 4°C prior to the analysis.

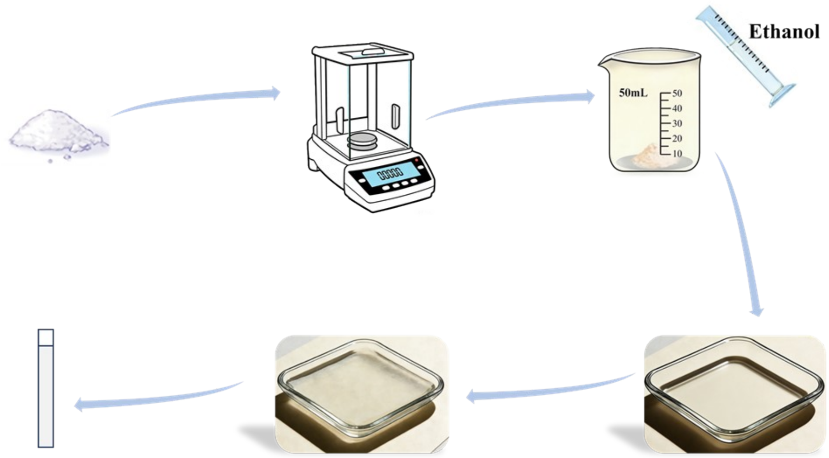

Fig. S1. The flowchart for the preparation of paper-based colorimetric test strips.

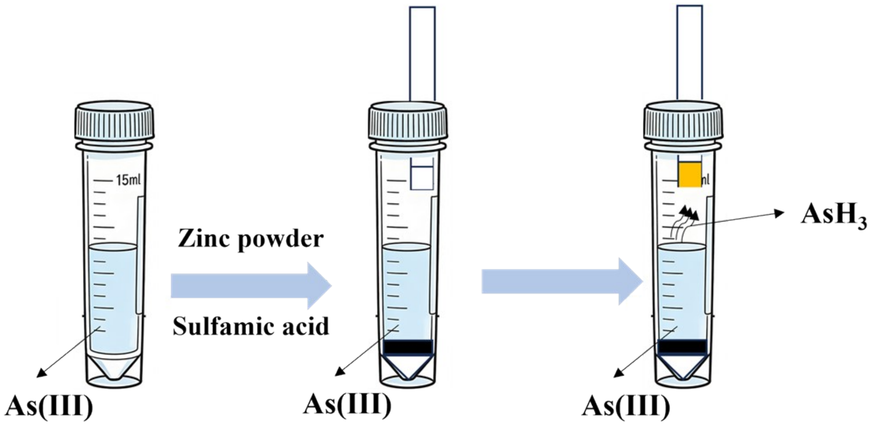

Fig. S2. The flowchart for paper-based colorimetric test strips analysis.

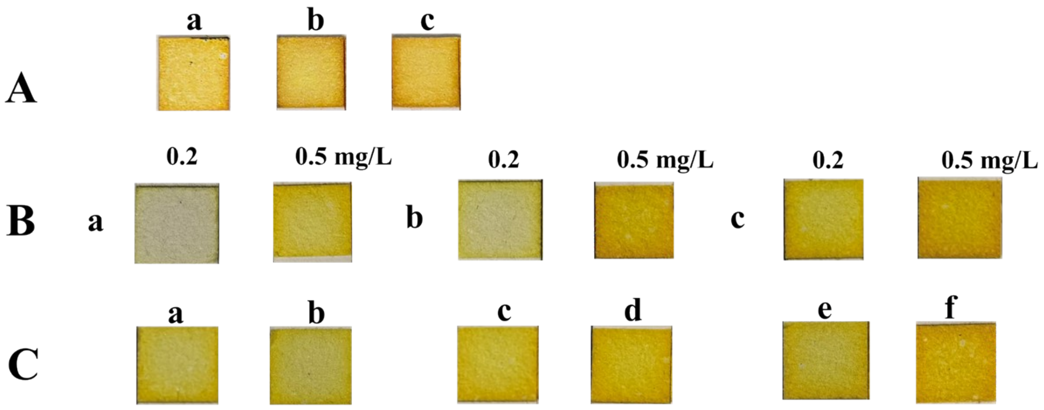

Fig. S3. Optimization of test strips. A. Optimization of the substrate material for test strips. a. A4 paper. b. Standard filter paper. c. Xuan paper. B. Optimization of the concentration of mercuric bromide reagent. a. 2% mercury bromide concentration. b. 5% mercury bromide concentration. c. 10% mercury bromide concentration. C. Optimization of preparation time. a. 10 min soaking and 15 min drying. b. 10 min soaking and 30 min drying. c. 30 min soaking and 15 min drying. d. 30 min soaking and 30 min drying. e. 1 h soaking and 15 min drying. f. 1 h soaking and 30 min drying.

Criteria	Score	Weight
1. Direct analytical techniques should be applied to avoid sample treatment.	0.85	2
2. Minimal sample size and minimal number of samples are goals.	0.49	1
3. If possible, measurements should be performed in situ.	1.0	2
4. Integration of analytical processes and operations saves energy and reduces the use of reagents.	0.8	3
5. Automated and miniaturized methods should be selected.	0.0	1
6. Derivatization should be avoided.	0.8	2
7. Generation of a large volume of analytical waste should be avoided, and proper management of analytical waste should be provided.	0.39	2
8. Multi-analyte or multi-parameter methods are preferred versus methods using one analyte at a time.	1.0	3
9. The use of energy should be minimized.	1.0	3
10. Reagents obtained from renewable sources should be preferred.	0.0	1
11. Toxic reagents should be eliminated or replaced.	1.0	3
12. Operator's safety should be increased.	0.8	3

Fig. S4. Analytical greenness report sheets for the presented procedure by AGREE tool.

Table S1. Analytical conditions for arsenic determination by ICP-MS.

Parameters	Conditions
RF power	1000 W
Plasma gas flow	13.0 L/min
Nebulizer gas flow	0.98 L/min
Lens voltage	6.0 V
Working mode	Dynamic reaction cell
Gas	NH_3
Instrument	ELAN DRC II (Perkin Elmer) with crossflow nebulizer with a Scott double-pass spray chamber and Ni cones

Table S2. The comparison of and other analytical methods for the determination of arsenic.

Samples	Method	LOD (μg/kg)	Time	Reference
Water	Zero-dimensional carbon-based nanodots	2.6×10^{-4}	>30 min	(Manisha, Kumara, Sonia, Abdul Junaid, Shim, & Sudhakara Prasad, 2026)
Rice	Gold nanodot-modified sensor	1	>30 min	(Gokhale, Dushing, & Panda, 2025)
Water	($Au/FeO_x/CC$) electrode	1.5	>30 min	(Xu, Pei, Zhang, & Jing, 2024)
Water Soil	Aptasensor integrated detection system	14.44 1970	>30 min	(Siddiqui, Khan, Jeon, & Park, 2020)
Vegetable oil	Mercuric bromide test strip	50	<30 min	The proposed method

Note: LOD: limit of detection.

Table S3. Results obtained As determination in the edible oil samples treated with the developed method and microwave digestion method. Values are expressed as mean ± standard deviation (n=3).

Type of oil	Proposed method	Microwave digestion
Peanut oil	0.103±0.006	0.107±0.004
Rapeseed oil	0.213±0.004	0.205±0.003
Soybean oil	0.106±0.004	0.113±0.005

References

Gokhale, N. A., Dushing, P. V., & Panda, S. (2025). Sugarcane based sustainable electrodes for the detection of arsenic from rice. *Microchemical Journal, 211*, 113074. https://doi.org/https://doi.org/10.1016/j.microc.2025.113074.

Manisha, H., Kumara, B. N., Sonia, J., Abdul Junaid, P., Shim, Y.-B., & Sudhakara Prasad, K. (2026). Covalently modified high purity carbon nanodots for enhanced detection of arsenic. *Talanta, 298*, 128922. https://doi.org/https://doi.org/10.1016/j.talanta.2025.128922.

Siddiqui, M. F., Khan, Z. A., Jeon, H., & Park, S. (2020). SPE based soil processing and aptasensor integrated detection system for rapid on site screening of arsenic contamination in soil. *Ecotoxicology and Environmental Safety, 196*, 110559. https://doi.org/https://doi.org/10.1016/j.ecoenv.2020.110559.

Xu, K., Pei, R., Zhang, M., & Jing, C. (2024). Iron oxide-supported gold nanoparticle electrode for simultaneous detection of arsenic and sulfide on-site. *Analytica Chimica Acta, 1288*, 342120. https://doi.org/https://doi.org/10.1016/j.aca.2023.342120.