

REVIEWER'S REPORT

Manuscript No.: IJAR- 59436

Title: Influence of Polystyrene Latex Carryover on Pyrolysis Mass Spectral Response.

Recommendation:

Accept after minor revision

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality			✓	
Clarity			✓	
Significance	✓			

Reviewer's ID: Dr. Bilqees Hamza

Detailed Reviewer's Report

General Overview

This manuscript investigates an analytical carryover phenomenon encountered during quality-assurance testing of a military biological detector. Following routine collection-efficiency qualification using polystyrene latex (PSL) aerosol particles, one of six detector units yielded an unexpected automated biological classification accompanied by an altered pyrolysis mass spectrum.

The author formulated a carryover hypothesis suggesting that residual PSL retained on the biological sample collection filter or within the sample path contributed interfering thermal degradation products. To evaluate this pathway, the study combined:

1. Spectral comparisons between PSL-only, expected sucrose simulant, and incident mass spectra.
2. Optical microscopy revealing foreign particulate residue within the incident filter mesh.
3. Four controlled verification experiments (direct co-loading, carryover generation without cleaning, simulant detection under carryover conditions, and a repeat verification run).
4. Validation of an upgraded, multi-step cleaning protocol that eliminated the interference.

The investigation is logically organized, methodologically sound, and addresses a practical problem in automated mass spectrometric detection. The manuscript demonstrates that styrene-derived pyrolysis fragments (m/z 51, 78, 104) from carryover PSL can distort the relative peak-height relationships of target simulant fragments (m/z 95, 123), leading to automated misclassification.

Key Strengths

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- Systematic Troubleshooting Framework:** The author moves logically from an operational anomaly to root-cause hypothesis generation, optical confirmation, controlled verification, and effective procedural remediation.
- Clear Analytical Mechanism:** The paper clearly explains the chemical basis for the spectral interference—linking PSL thermal degradation to styrene fragments (m/z 51, 78, 104) and sucrose thermal degradation to furan derivatives (m/z 95, 123)—and shows how their co-occurrence skews the detector's classification algorithm.
- Complementary Controlled Verification:** Executing four separate verification tests—including direct co-loading and deliberate omission of post-qualification cleaning—effectively proves that residual PSL can produce the observed spectral anomaly.
- Actionable Operational Remediation:** Demonstrating that a revised cleaning protocol (mechanical brushing + dual ultrasonic cleaning + magnified inspection) completely resolves the issue adds clear value for field operations and QA procedures.

Recommendations for Improvement

While the study is well-conceived and clearly presented, the following minor revisions should be addressed prior to publication:

- Explicitly Clarify Operational Conditions in Verification Tests:**

In Section E (Controlled Verification Tests), the author notes that post-PSL cleaning was intentionally omitted in Tests 2–4 to facilitate carryover. To avoid reader confusion regarding routine operating standards versus experimental stress conditions, briefly re-emphasize in Section E and Section F that this omission was an intentional diagnostic stress-test rather than a standard operating procedure.

- Standardize Spectral Peak Annotations Across Figures:**

In Figures 2, 3, 5, 6, 7, and 8, key mass peaks (m/z 51, 78, 104 for PSL and m/z 95, 123 for sucrose) are highlighted with red or blue circles. Ensure all figure captions explicitly define what the colored circles represent (e.g., "red circles indicate key simulant-derived furan peaks; blue circles indicate PSL-derived styrene peaks") to maintain visual consistency.

- Provide Brief Technical Specifications for the Cleaning Upgrades:**

Section Discussion (lines 192–194) outlines the new cleaning regimen. Adding minor operational details—such as the solvent used during ultrasonic cleaning (e.g., deionized water, ethanol, or isopropyl alcohol) and the duration of the ultrasonic cycle—will improve procedural reproducibility for other laboratories.

- Minor Editorial and Typographical Corrections:**

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- Remove minor duplicate word artifacts (e.g., "ver studies" in line 189, "ese findings" in line 203, "lection pathway" in line 204).
- Ensure uniform formatting of header titles (e.g., standardizing "Key words:-", "Introduction:-", and "Results:-" to standard journal bold headings).

Final Evaluation and Verdict

This manuscript provides a practical study on mass-spectral carryover interference in sequential aerosol collection and pyrolysis-MS testing. The investigative workflow is solid, the findings are supported by controlled testing, and the solution is verified.

The manuscript is **accepted with minor revisions**. Incorporating the minor textual adjustments, figure legend clarifications, and procedural details outlined above will prepare the paper for final publication.