

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need: Assessment of the sources of variability for the analysis of small glass fragments

Keyword(s): Glass, variability, small fragments, databases

Submitting subcommittee(s): Trace Materials **Date Approved:** September 19, 2023

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

Many studies have demonstrated the utility of LA-ICP-MS, μ XRF, and LIBS for the forensic analysis of glass. However, relatively few studies have explored the sources of variability for the analysis of small glass fragments, particularly when using μ XRF or LIBS. This research will provide further knowledge of the sources of variability and their improvement with the incorporation of advances in modern instrumentation. Moreover, this research can aid in the development of new standards for the analysis of glass using relatively novel instrumentation (e.g., LIBS).

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

Members of the glass task group are currently involved in research to address this need.

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

1. ASTM Standard E2926-17 Standard Test Method for Forensic Comparison of Glass Using Micro X-ray Fluorescence (μ -XRF) Spectrometry, ASTM International
2. ASTM Standard E2927-16e1 Standard Test Method for Determination of Trace Elements in Soda-Lime Glass Samples Using Laser Ablation Inductively Coupled Plasma Mass Spectrometry for Forensic Comparisons, ASTM International
3. T. Trejos and J. R. Almirall, Sampling strategies for the analysis of glass fragments by LA-ICP-MS Part I. Micro-homogeneity study of glass and its application to the interpretation of forensic evidence, *Talanta* 67 (2), 2005, 388-95.
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12. Corzo, R, Hoffman, T, Weis, P, Franco-Pedroso, J, Ramos D, Almirall J. The use of LA-ICP-MS databases to calculate likelihood ratios for the forensic analysis of glass evidence. *Talanta*, 186, 2018, 655-661.
13. Almirall J, Trejos T. Advances in the Forensic Analysis of Glass Fragments with a Focus on Refractive Index and Elemental Analysis. *Forensic Science Review* 2006,18(2):73-96.
14. Dorn H, Ruddle DE, Heydon A, Burton B. Discrimination of float glass by LA-ICP-MS: assessment of exclusion criteria using casework samples. *Can. Soc. Forensic Science*, 2015, Vol 48, 2, 2015, 85-96.
15. Naes BE, Umpierrez S, Ryland S, Barnett C, Almirall JR. A comparison of laser ablation inductively coupled plasma mass spectrometry, micro X-ray fluorescence spectroscopy, and laser induced breakdown spectroscopy for the discrimination of automotive glass. *Spectrochimica Acta Part B: Atomic Spectroscopy*
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4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at <https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest>? Is your research need identified by NIJ?

Yes, knowledge of the sources of variability for the analysis of small glass fragments is critical for the development of shared forensic glass databases, which relates to the NIJ research need “Construction of new and updating of existing databases with properties of manufactured materials.”

5. In what ways would the research results improve current laboratory capabilities?

Identifying and addressing the sources of variation for the analysis of small glass fragments can lead to improved measurement precision and improved laboratory practices, both of which can provide support to the practitioner when defending their results in court.

6. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

At the subcommittee level, this research would provide useful information for the glass training guide currently in development within the glass task group, and for current and potential future glass standards.

7. In what ways would the research results improve services to the criminal justice system?

Improving the understanding of the sources of variation for the forensic analysis of small glass fragments is necessary for the development of shared databases, which can be used to assign a significance to forensic evidence to help support the practitioner’s opinion in court.

8. Status assessment (I, II, III, or IV):

III

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.