

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need: Identifying Post-blast Residue of Liquid Explosives

Keyword(s): Explosives, Post-blast Residue, Hydrogen Peroxide, Nitromethane

Submitting subcommittee(s): Ignitable Liquids, Explosives, & Gunshot Residue

Date Approved: 3/02/2021

(If SAC review identifies additional subcommittees, add them to the box above.)

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)

Yes – Post-blast analysis guide.

Explosions and detonations can produce temperatures of thousands of degrees. As a result, there may be no intact explosive remaining in the post-blast residue. This is especially true with low-molecular weight explosives or explosive components, such as liquids (e.g., hydrogen peroxide, nitromethane, ethylene glycol dinitrate). The presence of unreacted material present post blast is dependent on a number of variables including degree of confinement, method of initiation and stoichiometry of the original explosive materials. There is a need to determine under what conditions liquid explosives survive detonation, identify where they or their residues are most likely to be found at post-blast scenes, determine the optimal methods to preserve, extract, and identify these material, and, if the intact explosive does not survive, establish characteristic profiles that permit reliable identification.

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)?

No.

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] Tarvin, M., McCord, B., Mount, K., Miller, M. "Analysis of hydrogen peroxide field samples by HPLC/FD and HPLC/ED in DC mode". Forensic Science International (2011), 209(1-3), 166-172.
[1] Tarvin, M., McCord, B., Mount, K., Sherlach, K., Miller, M. "Optimization of two methods for the analysis of hydrogen peroxide: High performance liquid chromatography with fluorescence detection and high performance liquid chromatography with electrochemical detection in direct current mode". Journal of Chromatography A (2010), 1217(48)m 7564-7572.
[3] Wang, B., Lv, X., Feng, D., Xie, L., Zhang, J., Li, M., Xie, Y., Li, J., Zhou, H. "Highly stable Zr(IV)-Based Metal-Organic Frameworks for the Detection and Removal of Antibiotics and Organic Explosives in Water" Journal of the American Chemical Society (2016), 138(19), 6204-6216.

[4] Kotrly, M., Eisner, A., Beroun, I., Ventura, K., Turková, I., “New possibilities of post-blast residues analysis in forensic science”, Proc. SPIE 11012, Detection and Sensing of Mines, Explosive Objects, and Obscured Targets XXIV, 1101212 (10 May 2019); <https://doi.org/10.1117/12.2519118>

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?

No.

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

Forensic analysts would be able to more reliably detect and identify liquid explosives in post-blast residue.

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

Forensic analysts would have a peer-reviewed document to cite as the scientific basis for the chemical identification of a liquid explosive in post-blast residue.

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

Forensic analysts would be able to testify to the chemical identification of a liquid explosive in post-blast residue with higher confidence.

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

I

	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.