OSAC Research Needs Assessment Form

Title of research need: Concentration of Extracts Containing Volatile/Unstable Explosives

Keywords: Concentration of extracts, Volatile explosives, solutions of unstable explosives, TATP, HMTD

Submitting subcommittee(s): Fire Debris & Explosives **Date Approved:** 5/12/2017

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

Background information:

1. Description of research need:

A general method to concentrate an analyte in solution is evaporation, with or without added heat, to remove excess solvent. TATP has sufficient volatility that it may evaporate at a rate comparable to that of the solvent. Thus, the analyst's attempt to increase the concentration of TATP to easily detectable levels, may result in the loss of TATP. A study is needed to identify the optimal methods of concentrating TATP solutions.
While HMTD is not volatile like TATP, its thermal stability is so low that a number of common extraction techniques may lead to its inadvertent decomposition.
Thus, with volatile/unstable explosives, the current analytical protocols of concentrating extracts may impede the analyst's ability to identify or even detect the explosive. Research to determine optimal concentration methods is needed.

2. Key bibliographic references relating to this research need:

Fan, W, Young, M, Canino, J, Smith, J, Oxley, J, Almirall, JR "Fast Detection of Triacetone Triperoxide (TATP) from Headspace using Planar Solid Phase Microextraction (PSPME) Coupled to an IMS Detector" Anal Bioanal Chem. **2012** 403(2), 401-408.
Oxley, J.C.; Smith, J.L.; Moran, J.; Shinde, K. "Determination of the Vapor Density of Triacetone Triperoxide (TATP) Using A Gas Chromatography Headspace Technique" *Propellants, Explosives, Protechnics,* **2005**, *30.2,* 127-130.
Oxley, Jimmie C.; Smith, James L.; Porter, Matthew; McLennan, Lindsay; Colizza, Kevin; Zeiri, Yehuda; Kosloff, Ronnie; Dubnikova, Faina "Synthesis and Degradation of Hexamethylene Triperoxide Diamine (HMTD)" Propellants, Explosives, Pyrotechnics **2016**, 41(2), 334-350.

3a. In what ways would the research results improve current laboratory capabilities?

The results of this research would provide the analyst guidance as to the optimal methods for sample preparation and concentration of solutions of volatile/unstable explosives for chemical analysis.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

Not only will this research aid the practicing forensic scientists in individual cases, it will provide a better scientific understanding of the characteristics/properties of volatile or unstable explosives.

3c. In what ways would the research results improve services to the criminal justice system?

Forensic analysts would be more likely to detect and/or identify the presence of volatile or unstable explosives in a post-blast matrix. This should aid law enforcement in their investigation of the explosion.

4. 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.

Subcommittee Approval date: 5/26/2017

(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)

SAC

1. Does the SAC agree with the research need? Yes (Yes) NO (NO)

2. Does the SAC agree with the status assessment? Yes (Yes) NO (NO)

If no, what is the status assessment of the SAC:

Approval date: 12Feb2018 [SAC voted yes to both questions]

(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)