A30 Forensic Analysis of Triacetone Triperoxide (TATP) for Information on the Synthetic Route and Precursor Identity

Kimberly L. Painter, BS, Charles D. Clark, BA, BS, Meghan McCormick, BS, and Michael Sigman, PhD*
University of Central Florida, National Center for Forensic Science, PO Box 162367, Orlando, FL 32816-2367

After attending this presentation, attendees will be able to understand the success and limitations of the approach to determine the identity of the precursor material as well as the synthetic route.

This presentation will impact the forensic science community by showing that it could be possible to determine which precursor chemicals were used in a particular synthesis of TATP, or in discriminating between different batches of TATP possibly found at multiple crime scenes.

Triacetone triperoxide (TATP) is a primary high explosive that has been linked to various terrorist attacks worldwide, including the failed attack on an American Airlines flight in 2001 by the infamous "shoe bomber", and the 2005 London subway bombings. For more than twenty years TATP has been the explosive of choice among many terrorist groups because its synthesis is relatively simple, and because the precursors used in the synthesis of TATP can be readily obtained from commercial sources. For these same reasons TATP has also become alarmingly popular among "amateur teenage scientists", as is evident by the prodigious number of amateur videos uploaded to the Internet showing the preparation and detonation of homemade TATP. The proliferation of information on the Internet regarding TATP has created an ever increasing problem for homeland security and law enforcement organizations. Though Internet recipes for the synthesis of TATP are easily found, they often differ in which commercially available precursors are recommended for use as substitutes for pure laboratory grade chemicals.

The research reported here is focused on the analysis of uninitiated and initiated TATP samples for the purpose of obtaining information about the precursor chemicals used in the synthesis, as well as gaining information that might indicate the particular synthetic route used by a terrorist or criminal. Many industrial and commercial chemicals commonly used as precursors in the illicit synthesis of TATP often contain additives and contaminants which can potentially carry through the TATP synthesis. If these additives can be detected in the final product, they might be used to forensically determine which precursor chemicals were used in a particular synthesis, or in discriminating between different batches of synthesized TATP, possibly found at multiple crime scenes.

TATP was synthesized by licensed personnel using a variety of Internet recipes, and using both reagent grade and industrial and commercial grade precursors. Precursor chemicals were analyzed for additives and impurities prior to their use in TATP synthesis. The additives and impurities were identified when possible and cataloged. Synthesized samples were then analyzed for the presence of trace impurities and additives, and matched against standards. TATP samples were detonated using a BAM Fallhamer device. Optimized analytical methodologies were developed using gas chromatography-mass spectrometry (GC-MS), electrospray ionization-mass spectrometry (ESI- MS), ion mobility spectrometry (IMS), and polarized light microscopy (PLM). Data and results will be presented to demonstrate successes and limitations of this approach, and the potential forensic value of the analyses will be also be discussed.

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TATP, Peroxides, Explosives

 ** Presenting Author*