



A188 Identification of Peroxide and Traditional Anion Explosive Residues by Capillary Electrophoresis

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The goal of this presentation is to describe the analysis of peroxide explosives through capillary electrophoresis (CE) with a traditional borate buffer, which allows the detection of peroxide explosives in a method that was designed to detect anions associated with low explosives.

This presentation will impact the forensic science community by being the first use of CE to screen for peroxide explosives in addition to its more traditional ionic analytes and will enable an explosives' chemist to screen for anions commonly associated with low explosives and peroxide explosives simultaneously, without the use of separate methods and preparations.

The analysis of traditional explosive residues can be a difficult task for the forensic chemist. There are many methods to choose from and they can be performed on a wide variety of instruments. Few of the methods give definitive answers, but instead provide results that investigators use to infer the types of explosives employed. Due to the nature of explosives, it is unusual to find a single method that will analyze for multiple types of explosives without the use of several extractions or instruments. Although not new to the scientific world, peroxide explosives are now the explosive of choice for terrorist bombers and present new challenges to scientists as investigators attempt to identify residues left behind after an attack.

Terrorists choose to use peroxide explosives in improvised explosive devices (IEDs), because they offer devastating explosive power without the challenges of procuring and packaging traditional explosives. Even though they have destructive power close to TNT, peroxide explosives are not used in military or commercial applications due to their low stability, sensitivity to impact, and high volatility. Most recently peroxide explosives have been used by Richard Reid in 2001, the London Train Bombings of 2005, and by Joel Heinrichs III outside a University of Oklahoma football game in 2005. Peroxide explosive residues are an analytical challenge due to their volatility, as well as their simple structure which lacks distinctive metallic and ionic signatures.

Capillary electrophoresis (CE) is a separation technique that is used in many different aspects of forensic science and is common to most crime laboratories. CE is considered an excellent separation technique for explosives due to its sensitivity, ease of sample preparation, reproducibility, and rapid analysis. CE offers the explosive analyst the ability to detect multiple explosive ions in a single examination. Although successfully used to identify traditional explosives (anion, cation, and commercial explosives), CE has yet to be used to identify peroxide explosives.

The method presented uses a borate buffer, a dichromate chromophore, and diethylenetriamine (DETA) as the electroosmotic flow (EOF) modifier. The method was optimized from traditional borate buffer methods by adjusting the pH and DETA content. Samples are visualized by a UV detector in the indirect mode using both 200 and 254 nm wavelengths. This buffer system is able to separate traditional anion oxidizers as well as TATP.

Peroxide Explosives, Capillary Electrophoresis, Anions