

## **ANALYSIS OF INORGANIC EXPLOSIVES BY ISOTOPE RATIO MASS SPECTROMETRY, RAMAN SPECTROSCOPY AND INFRARED SPECTROSCOPY**

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As part of a study of inorganic explosives (pre-detonation), the individual chemical components were investigated along with three types of inorganic explosive mixtures, Black Powder, Black Canyon and Pyrodex. The individual components and mixtures were analysed to determine isotopic ratios and elemental composition for both carbon and nitrogen by Isoprime Continuous Flow-Elemental Analyser-Isotope Ratio Mass Spectrometry. Raman and Infrared Spectra for the components and mixtures were also studied. The development of a new method for the analysis could have great benefits in the discrimination between these similar mixtures for forensic and criminal investigations.

Profiling of the composition of the explosives, as well as the manufactured by-products, could prove important in linking information between the explosive and the specific company or laboratory in which it was manufactured or in linking homemade explosives to a suspect or source of raw materials.

It was found that the discriminatory power of Raman and Infrared Spectroscopy was insufficient for the inorganic explosives due to fluorescence. However, Isotope Ratio Mass Spectrometry (IRMS) was shown to be a valuable method for the discrimination between Black Powder, Black Canyon and Pyrodex powders pre-detonation. Based on the successful analysis of the components and explosive mixtures by IRMS, this mass spectrometry technique is a useful advanced analytical technique for forensic investigations.