Application Note RAD9000

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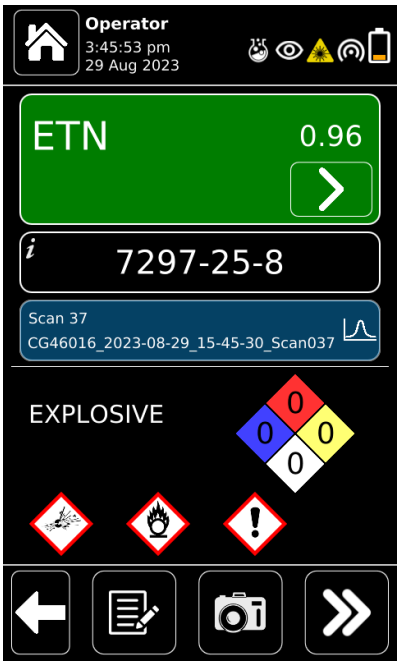
DETECTION OF HOMEMADE EXPLOSIVES

Introduction

As commercial explosives become more difficult to obtain, terrorists turn to producing homemade explosives (HMEs). HMEs are typically produced in makeshift labs using materials that can be easily obtained by the public. Because HMEs are synthesized under improvised conditions, the product typically contains impurities, many of which color the sample and produce fluorescence so they cannot be analyzed using previous generation 785 nm Raman-based systems. Handheld Raman using 1064 nm excitation reduces fluorescence interference and allows for many of these HMEs to be easily identified in the field with little or no sample preparation.

Chemical Detection in the Field

A variety of homemade and commercially available explosives were measured with a handheld Rigaku CQL Series 1064 nm Raman analyzer. The 1064 nm handheld Raman has the ability to obtain quality spectra and distinguish the explosive materials and their precursors from other materials.



Screenshot of ETN result using a Rigaku 1064 nm Raman analyzer.

Minimize Sample Interference while Maximizing Efficiency

A feature found in the most common HMEs is color, due to impurities that are present in the sample. This causes fluorescence interference when using a Raman analyzer with 785 nm excitation. The Rigaku CQL Max-ID™ or CQL Gen-ID™ handheld analyzer uses a 1064 nm longer excitation wavelength laser, and is able to measure a wider range of materials. Figure 1 demonstrates the comparison of spectra obtained using a 785 nm handheld Raman analyzer to the 1064 nm of a Rigaku device. It is demonstrated that the Rigaku device has the ability to measure the colored HMEs without fluorescence interference.

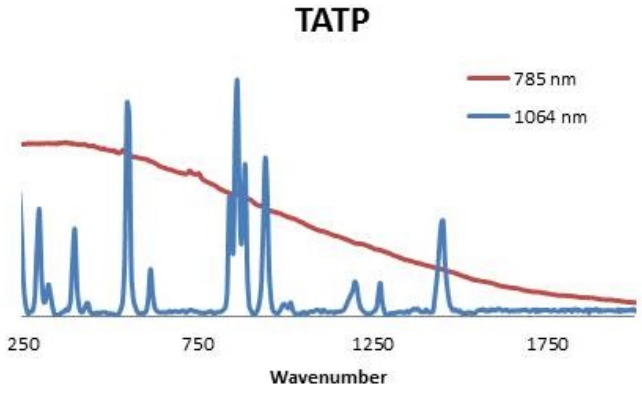
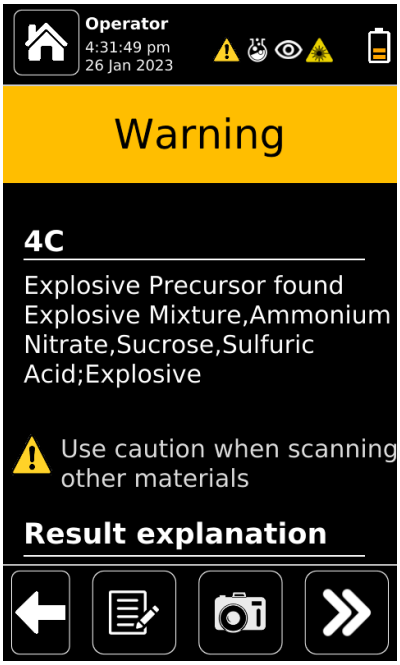


Figure 1. Raman spectra of TATP using 1064 nm (blue) and 785 nm (red).

Conclusion

The unique features of Rigaku's CQL Series of handheld 1064 nm Raman analyzers make them the tool of choice for the analysis of explosives, as well as explosive precursors. With the use of 4C™ Technology, Rigaku's CQL analyzers also contain an on-board library of recipes, that will warn the user of potential ingredients being used to manufacture a larger threat. Rigaku systems are portable and lightweight to support flexible screening operations and search. The system has been designed for ease of use and contains a comprehensive database of chemical signatures that is regularly and easily updated. In addition to providing identification of substances in bulk form, the Rigaku CQL analyzer is the first field-ready handheld Raman tool to also provide trace analysis of narcotics and explosives. With the addition of QuickDetect™ Mode, users are provided automated colorimetric results for the detection of non-visible trace amounts in seconds.



Explosive precursor chemical result with a Rigaku 1064 nm Raman analyzer with 4C Technology enabled.

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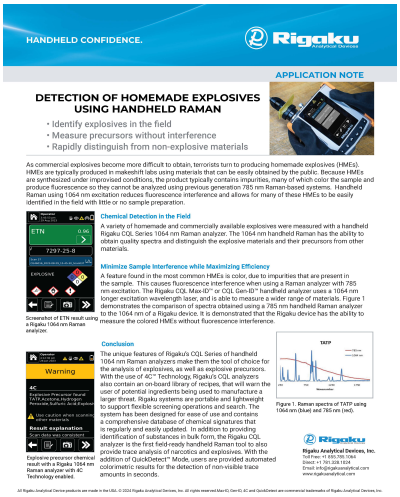

HANDHELD CONFIDENCE.

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APPLICATION NOTE

DETECTION OF HOMEMADE EXPLOSIVES USING HANDHELD RAMAN

- Identify explosives in the field
- Measure precursors without interference
- Rapidly distinguish from non-explosive materials

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Screenshot of ETN result using a Rigaku 1064 nm Raman analyzer.

Chemical Detection in the Field

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Minimize Sample Interference while Maximizing Efficiency

A feature found in the most common HMEs is color, due to impurities that are present in the sample. This causes fluorescence interference when using a Raman analyzer with 785 nm excitation. The Rigaku CQL Max-ID™ or CQL Gen-ID™ handheld analyzer uses a 1064 nm longer excitation wavelength laser, and is able to measure a wider range of materials. Figure 1 demonstrates the comparison of spectra obtained using a 785 nm handheld Raman analyzer to the 1064 nm of a Rigaku device. It is demonstrated that the Rigaku device has the ability to measure the colored HMEs without fluorescence interference.

Explosive precursor chemical result with a Rigaku 1064 nm Raman analyzer with 3C Technology enabled.

Conclusion

The unique features of Rigaku's CQL Series of handheld 1064 nm Raman analyzers make them the tool of choice for the analysis of explosives, as well as explosive precursors. With the use of 4C™ Technology, Rigaku's CQL analyzers also contain an on-board library of recipes, that will warn the user of potential ingredients being used to manufacture a larger threat. Rigaku systems are portable and lightweight to support flexible screening operations and search. The system has been designed for ease of use and contains a comprehensive database of chemical signatures that is regularly and easily updated. In addition to providing identification of substances in bulk form, the Rigaku CQL analyzer is the first field-ready handheld Raman tool to also provide trace analysis of narcotics and explosives. With the addition of QuickDetect™ Mode, users are provided automated colorimetric results for the detection of non-visible trace amounts in seconds.

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Rigaku Analytical Devices, Inc.

Related products

CQL Gen-ID

A cost-effective solution for departments looking for target ed chemical threat analysis

CQL Max-ID

Offers features and benefits that maximize chemical threat analysis in safety and security applications