ADVANCED 1064 nm RAMAN TO COUNTER THREATS IN TRANSPORTATION SCREENING

New Explosive Threats and Deadly Narcotics

In June 2018, in response to a foiled terrorist plot in Australia and long-standing concerns about improvised explosive devices (IED) containing powder explosives, the U.S. Transportation Safety Administration (TSA) announced and implemented new screening requirements. Passengers with carry-on baggage containing powdered materials in quantities above 12 oz (350 milliliters), the capacity of a soda can, could be subject to additional screening. U.S.-bound flights from 280 international airports are now required to implement these new screening requirements.
Combustible powders can present in many forms, from fertilizer to mining grade explosives. In addition to those that could pose a threat when used in IEDs, security operators in airports, law enforcement and customs operations are also concerned with illicit narcotics in powdered form. The transport of deadly narcotic opioids, such as fentanyls, pose dangers to screeners and passengers alike. Fentanyl derivatives, like carfentanyl, are lethal in quantities as small as a single gram. These opioids present danger to law enforcement when interdicted or discovered. New Raman analyzers can play a role in preventing unnecessary or unintentional exposure of first responders, law enforcement, and the public, to this danger.

Improved Threat Detection for Checkpoint and Airport Screening

Security operators require enhanced detection capabilities to detect emerging and evolving threats. Cosmetics, spices, coffee and protein mixes are common powders and could be subjected to screening. New or additional checkpoint screening requirements slow screening operations and often result in longer lines and delays as passengers need to remove their carry-on powdered items. Security officers are challenged to screen and possibly re-screen substances to identify and determine that they are safe to carry aboard aircraft.

Advancements in mobile and handheld chemical threat identification technology can increase operational efficiency by streamlining passenger and baggage screening processes. Rigaku's 1064 nm handheld Raman is an example of an advanced next generation technology providing rapid and actionable results required for airport and transportation hub security operations.

High Performance Raman Spectroscopic Analyzers

Used in the field by the military and law enforcement departments around the world for over 20 years, first generation portable Raman spectroscopic systems used shorter wavelength (785 nm) lasers to measure the energy scattered by a target material and compare its specific signature to a built-in library to identify substances. Raman technology is nondestructive which allows the target material to be preserved for evidentiary purposes. Raman analyzers can determine if a material is a harmless powder, illicit substance, or a powdered explosive. However, these 785 nm Raman systems have significant limitations and are unable to identify the broadening range of chemical substances currently in the threat stream or of interest to law enforcement.

1064 nm Raman Systems

New advanced Raman systems are now available that utilize a longer wavelength of laser (1064 nm), to support the reliable identification of an expanded library of threats and chemicals of concern to TSA, security operators and law enforcement in the U.S. and around the globe. These high-performance analyzers address the critical challenge fluorescence poses to older Raman systems.

Fluorescence occurs when the system's laser beam is absorbed by the powder or substance being analyzed, preventing the system from being able to discern characteristic spectral peaks sufficiently to render its identification to the user. Many current threats, contraband, as well as common cutting and filler substances, exhibit fluorescence. Colored materials and packaging also fluoresce, confounding identification of a wide range of chemicals, narcotics and materials of concern. 1064 nm Raman systems are proven to limit sample-induced fluorescence interference, thus broadening the range of identifiable materials to include colored substances, organically derived materials and colored/degraded substances within colored packaging without having to open the package to disturb the sample. Substandard or counterfeit drugs can easily be identified as well.

Portable, Rapid and Accurate Identification

Raman systems utilizing 1064 nm laser technology are currently available from Rigaku Analytical Devices. The [Rigaku CQL portfolio of 1064 nm analyzers](#) detect the chemical structure and physical characteristics of its target. Preloaded algorithms then compare the sample's characteristics to the system's database for identification. The Rigaku portfolio of handheld Raman analyzers can identify and distinguish between closely related substances with its onboard and easily expandable database of over 13,000 chemicals and compounds. The system identifies and alerts operators to threat precursors, powders and threats presented in mixtures with benign materials. A vital addition to security screening operations, the Rigaku instrument processes and delivers results in less than 40 seconds to allow for rapid screening of passengers.

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.

The onboard camera of the Rigaku CQL 1064 nm Raman analyzers supports the evidentiary collection process by allowing the operator to capture multiple pictures of the sample and surroundings. The images are stored with the analysis in a tamper-proof file. 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™ Technology, users are provided automated colorimetric results for the detection of non-visible trace amounts in seconds.

Examples of result screens from Rigaku CQL Series handheld 1064 nm Raman analyzers for chemical threat identification.

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APPLICATION NOTE

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Related products

CQL Gen-ID

A cost-effective solution for departments looking for targeted chemical threat analysis

CQL Max-ID

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