

Raman IdentiCheck

Portable Raman System



The PerkinElmer® Raman IdentiCheck™ is a unique instrument that combines the convenience of a portable, hand-held triggered probe system with the performance of a highly specified laboratory instrument. It is the perfect choice for in-situ Raman analyses performed away from the normal laboratory but where high quality data is essential.

Advantages of Raman spectroscopy for material identification

Historically, portable sample analyzers have been the domain of Near-IR and FT-IR spectrometers, but recent advances in Raman technology make it superior for analysis of this type. Raman spectra are highly specific to the material being analyzed and hence can be used as a fingerprint for material identification. The spectrum of a sample being analyzed can be searched against either user-generated libraries or commercially purchased libraries of specific types of materials such as narcotics, explosives, polymers, minerals, etc. Accurate sample identification takes a matter of seconds.

These attributes are in some ways similar to Mid-IR spectroscopy but Raman spectroscopy has several advantages.

- There is normally no sample preparation required.
- Material identification can be carried out through various packaging materials. Samples can be analyzed while still contained in plastic bags or glass or plastic bottles (Figures 1 and 2).

Key Features

- ▶ High performance in a convenient portable system giving confidence in results and decision-making
- ▶ Hand-held triggered probe for analysis through glass and plastic protects analyst and preserves integrity of sample
- ▶ Comprehensive software processing including library searching for accurate sample identification in seconds
- ▶ 21 CFR Part 11 compliant ES software available, including AssureID material checking software
- ▶ Calibration to ASTM, and NIST standard, with optional IQ/OQ

The inability to work through containers has historically been a weakness of FT-IR (Mid-IR) spectrometers. As a result, for many years Near-IR spectrometers have often been used for this type of analysis. Although Near-IR analyses can be carried out through containers using suitable probes, the resultant spectra are less specific than either Mid-IR or Raman, and so Near-IR is less suitable for library searching and is applicable to a more limited sample set. In this respect, it is often said that

Raman spectroscopy combines the high specificity of Mid-IR spectroscopy with the sampling convenience of Near-IR spectroscopy.

- Aqueous samples can be analyzed more easily since water has weak Raman spectral features.
- The identification of inorganic materials is straightforward. The inorganic materials can be mineral samples in their own right or present as additives or fillers in composites such as paints, polymers or pharmaceutical formulations.
- By using a fiber probe, analyses can be made in-situ and remote from the spectrometer. This method of analysis has great advantages for forensics, homeland security, quality control analyses in warehouses, and conservation analyses; in fact, for any analysis where it is inconvenient to move the sample to the spectrometer.

Convenience of a portable, remote analysis system with the reassuring performance of a laboratory-based spectrometer

Reducing the size of most analytical technologies to hand-held dimensions can result in a significant drop in performance. In spectral terms, this performance decrease produces spectra of lower resolution, reduced spectral range and increased noise. In practice, this results in decreased ability to identify samples correctly and hence increases the number of false positives and false negatives.

For application areas such as scene of crime and homeland security analyses or pharmaceutical identification, the reduced performance provided by handheld instruments can be unacceptable. Many different pharmaceutical materials have similar (but different) Raman spectra which require high quality data to differentiate between them. The importance of the decisions being made based on forensic and homeland security analyses means that the data and results have to be unambiguous.

The PerkinElmer Raman IdentiCheck combines the convenience of a triggered probe sampling system (Figure 3) with the high performance of a laboratory-based instrument into a portable instrument that can be taken easily to the point of analysis. Sample analysis is carried out using the light-weight triggered probe and the high quality, unambiguous results mean that decisions can be made with great confidence and assurance.

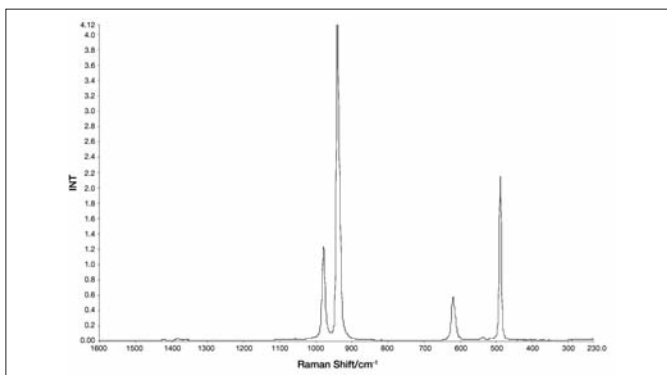


Figure 1. Spectrum of potassium chlorate (explosive precursor) through glass bottle.

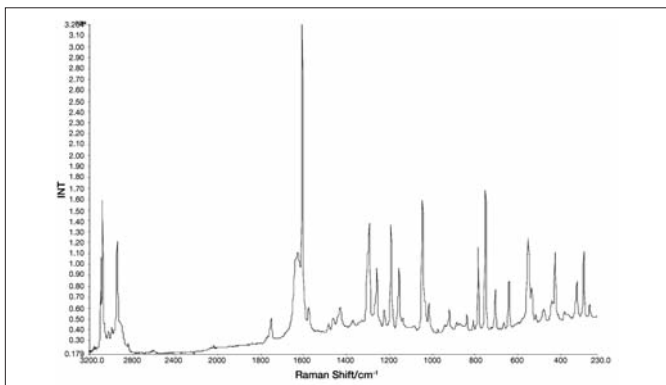


Figure 2. Spectrum of acetylsalicylic acid (aspirin) through plastic bag.



Figure 3. The hand-held trigger probe can be used for a range of samples.

The PerkinElmer Raman IdentiCheck

This system consists of:

- **High performance echelle spectrometer** providing a full-range (3500-230 cm^{-1}) spectrum at a high spectral resolution of 4 cm^{-1} (1 cm^{-1} pixel resolution) with high sensitivity in 1 second.
- **A triggered probe on a 5 meter optical cable.** The cable is metal-clad for protection. The probe has a specially designed nose-piece which ensures that the sample being analyzed is at the optimum focal point and also excludes unwanted fluorescent or natural light from entering the probe.
- **A choice of tablet or laptop PC** provides all the processing power to collect and analyze the data in a small, convenient footprint. Touch screen interface can be used in environments where gloves and protective clothing make keyboard use difficult.
- **Optimized software.** Just as the optical unit has the same high performance as a laboratory-based instrument, the software provided has all the features and functionality required for simple yet sophisticated Raman analyses. Unique data processing features such as photo-bleaching and automatic baseline correction are standard with the software ensuring that the high optical performance married with this processing power ensures that even highly fluorescing samples can be analyzed quickly and efficiently (Figure 4).

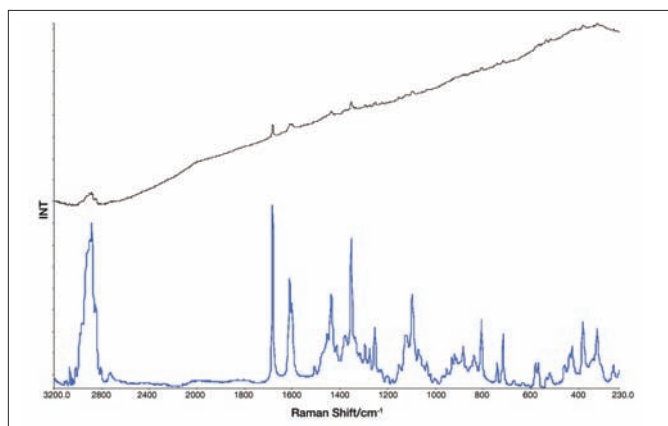


Figure 4. Spectrum of fluorescing tablet before and after photo-bleaching and baseline correction

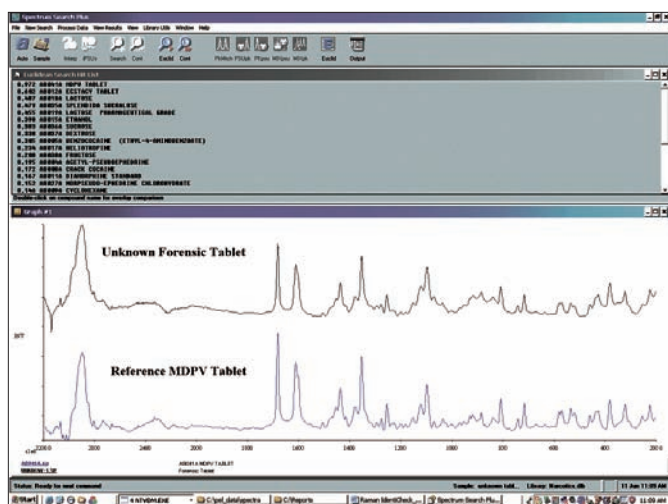


Figure 5. Result of library search.

Once a spectrum is obtained, it can be searched against a reference library for identification or confirmation (Figure 5).

For QC or QA laboratories or warehouses where this material identification needs to be taken a step further, it may be more convenient to process the spectrum using the AssureID™ software. This software not only confirms the identification but also registers a Pass or Hold result based on pre-set quality criteria. This software is available in standard form or in Enhanced Security™ (ES) format where it may be required in the pharmaceutical and healthcare environments.

- The system can be mains or battery powered. An optional portable power pack is available and the system can also be powered via a 12 volt car supply.
- Raman IdentiCheck is packed into a portable, wheeled case, with retractable handle suitable for transportation (Figure 6).



Figure 6. Raman IdentiCheck is packed into a robust case with retractable handle for transportation.

Application areas

- Laboratory-based or field-based forensic analysis
- Homeland security
- Laboratory or warehouse QA/QC analysis
- In-situ conservation analysis
- Analysis of samples in specialist enclosures such as fume-cupboards
- Laboratory or in-field geological analysis
- Any field-based material identification analysis such as chemical spillage or environmental analysis.

Specifications

A high performance Raman spectrometer covering the spectral range 230-3500 cm^{-1} and providing 4 cm^{-1} spectral resolution (1 cm^{-1} pixel resolution)

The system comprises:

- Proprietary F2 Raman echelle spectrograph, complete spectral coverage at high resolution with no moving parts
- High sensitivity open electrode CCD, 1024 x 256 pixels
- Hermetically sealed vacuum
- Air cooled operation at $-50\text{ }^{\circ}\text{C}$
- 785 nm laser (300 mW) providing user-adjustable laser power between 100 and 10 mW at sample
- Kinematically-mounted, zero-alignment optics

- All internal optics are optimized for Near-IR performance, offering unsurpassed response at long wavelengths
- Software for Raman data acquisition and processing; instrument control, data manipulation and analysis, and flexible report utilities
- Spectrum software as standard. Spectrum Search software is included with non-ES system
- Laser Class 3b product

Raman Trigger Probe

- Patented micro-optics for beam steering and background features (OD 8 at the excitation wavelength)
- Spectral range of 230-3500 cm^{-1}
- 5 meters of steel-encased fiber optic cable
- 'In use' LED
- Nosepiece for the probe ensuring optimum sample focus for direct sample contact, analysis through plastic bags and analysis through glass bottles. The nosepiece also eliminates unwanted fluorescent or natural light
- Safety mechanism to prevent accidental triggering of probe
- Probe capable of withstanding $80\text{ }^{\circ}\text{C}$

PC specifications

- Designed for use with a laptop or tablet PC.

For further applications information, visit www.perkinelmer.com/raman.



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