

## Low Cost & Portable Raman Spectrometer Analysis of Pharmaceuticals

Raman spectroscopy is a valuable tool for quickly inspecting solid, liquid, and powder pharmaceuticals and pharmaceutical precursors. The versatility and affordability of modern Raman spectrometers makes them a vital component in most labs and pharmaceutical manufacturing facilities. Raman spectroscopy fills a crucial role in development, process, and quality control of pharmaceutical products.

### What is Raman Spectroscopy?

Raman scattering was discovered by an Indian born physician by the name of Sir Chandrasekhara Venkata Raman. Raman discovered that light would scatter and change its wavelength based on what sample it

passed through. Using lasers, this phenomenon can provide a fingerprint for chemicals based on their inelastic scattering.

The response can be measured using a filtered probe and high resolution spectrometer with a thermos-electric cooler. This method provides a rapid means to identify almost any type of chemical sample.



Low Cost & Portable Raman spectrometers offer many advantages in the Pharmaceutical Industry

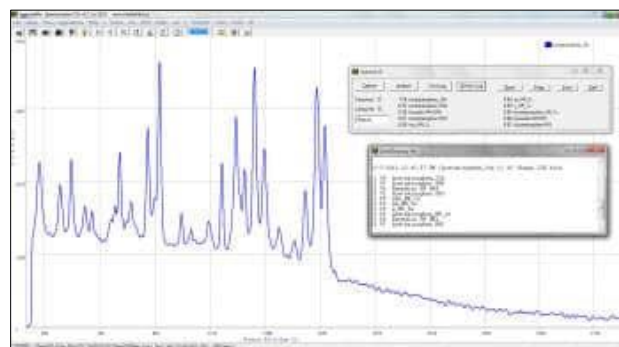
### Advantages of portable Raman Analysis in the Pharmaceutical Industry

- Extremely unique spectral fingerprints provides high accuracy
- Non-destructive, non-contact, and no sample preparation necessary
- Low sample volumes required
- Able to penetrate glass & plastic packaging
- Fast, compact, & rugged
- Process, laboratory, or field deployable

### Pharmaceutical Applications of Low Cost & Portable Raman

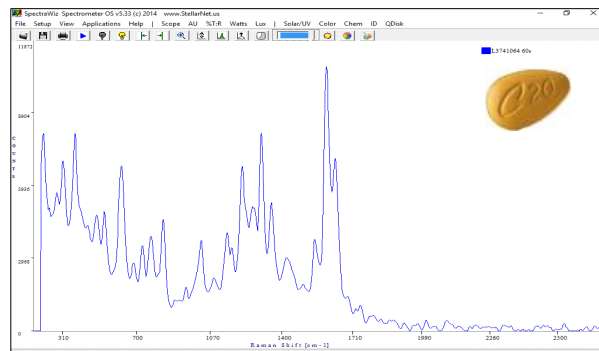
The many advantages of low cost and portable Raman spectrometers lend the technique to a variety of different pharmaceutical applications including:

- **Raw material confirmation** – incoming raw materials and chemicals can be verified and checked for correctness as well as adulterants/contaminants.
- **Positive identification and pharmaceutical matching** – improves quality control on the manufacturing floor, in inventory, and at the shipping dock. Spectral fingerprint libraries are available with pharmaceutical matching capability.



**Pharmaceutical Match Test-** Raman-HR-TEC 785nm Raman spectra of Tylenol (Acetaminophen/Paracetamol) displaying Library search hit of Tylenol as #1 and Excedrin (containing Acetaminophen/Paracetamol) as #2

- Counterfeit detection** – pharmaceuticals that are counterfeit are manufactured and sold with the intent to deceptively represent their authenticity. They may contain inaccurate quantities of active ingredients, be inappropriately processed, and contain hazardous adulterants. These counterfeit drugs are first and foremost a threat to human health and safety but also can breach intellectual property rights.
- Polymorph analysis** – can influence solubility and efficacy of an active drug as well as provide patent protection, however, may be altered during processing. Dispersion of a drug through a tablet ensures correct dosage, yet aggregation can occur even though there were only subtle changes in raw material or processing conditions. Raman spectroscopy can give detailed information on these most important properties.
- Tablet Coatings** – thickness and uniformity is important for the quality, stability, and safety of final pharmaceutical products. Raman spectrometers can be used for quality control and monitoring the coating process to examine tablet coating consistency.
- Molecular characterization & R&D** – availability of low cost Raman systems allows more access to the technique expanding capability, reducing costly mistakes, and speeding up the development process.



**Counterfeit detection-** Raman-HR-TEC 1064nm Raman detection of counterfeit Cialis. In Jan 2015, the FDA Analyzed a batch of imported counterfeit Cialis. It was chemically analyzed and found to contain tadalafil, which is the active ingredient in real Cialis, as well as sildenafil, the active ingredient in Viagra and warned that the there was potential for danger in mixing the two compounds. The fake Cialis was labeled CLALIS

## Raman Solutions from StellarNet, Inc.

StellarNet offers both modular Raman systems and completely integrated and rugged case systems for portable applications.

The modular system allows users to mix and match components and typically consists of a high performance Raman spectrometer, adjustable power laser, and probe or sample holder. Many wavelengths are available and 532, 785, & 1064nm are considered standard options.

The StellarCASE-Raman system includes interior mounting of spectrometer instrumentation pre-configured for “Open & Measure” application, with no additional setup required. With a simple press of the “Analyze” button instantaneous match results can be display on your screen.

Contact our team of technical sales scientists for more information



**Modular Raman System**  
consisting of a spectrometer, laser, & probe



**Integrated Portable System**  
Pre-installed, easy to use, rugged with 8hr battery