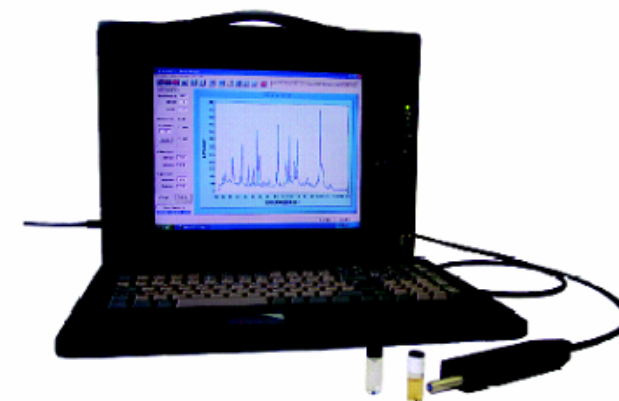


“Take A Closer Look”

The *InSITE*TM

Remote Spectroscopy
System for *in situ*
Chemical Analysis



The InSITETM Portable Raman Analyzer for
Remote Chemical Analysis.

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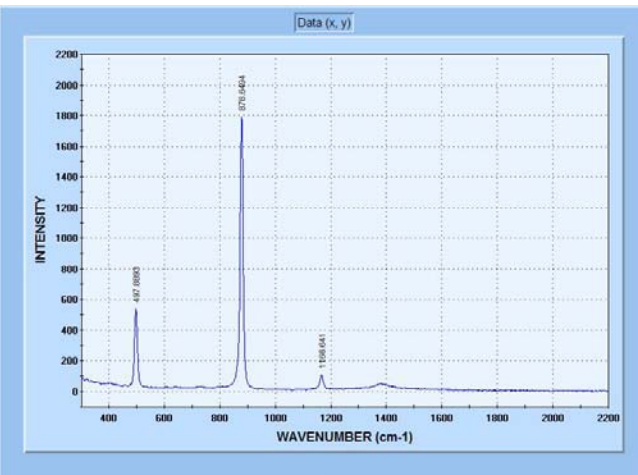
www.symphotic.com

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880 Calle Plano, Unit K
Camarillo, CA 93012
805-484-6639
1-866-828-4388 (toll free)

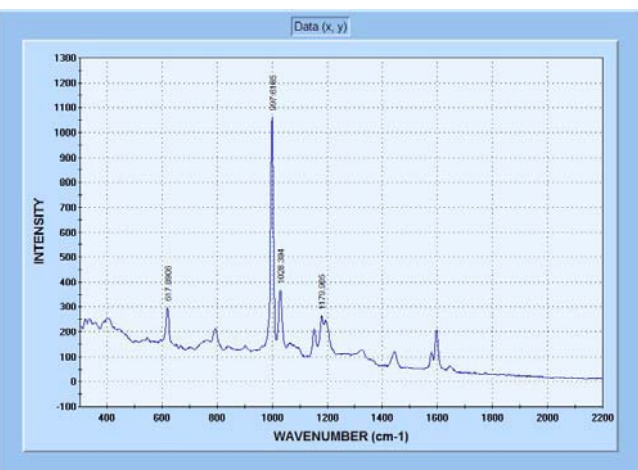
Winner of the 2006 NEI Top Industry Practice Award



Raman Spectrum of boric acid



Fluorescence Spectrum of white epoxy paint chip



Raman Spectrum of white plastic

Symphotic Tii Corporation

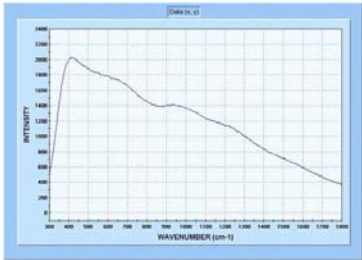
We are experts in providing solutions for nuclear power plants and other radiation environments. Our AquaRAD® radiation tolerant color cameras are the world's first solid state color cameras for use in radiation environments.

For several years NASA has been developing Raman analyzers for determining the chemical composition of rocks and minerals on Mars. We have adapted this technology and developed the InSITE™, a new approach to in-situ chemical analysis in hazardous areas.

Application example: using the InSITE™ in pressurized water nuclear reactor (PWR) applications:

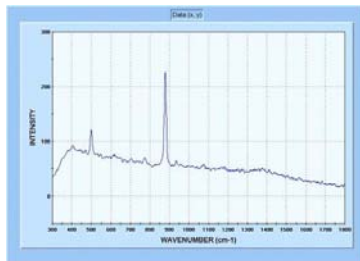
The InSITE™ Raman Analyzer has been used at nuclear power plants to identify and characterize boric acid stains from possible reactor coolant solution (RCS) spills or leaks. The unique spectrum of boric acid permits positive and unequivocal identification. Also, since boric acid can be found in two forms with different spectra: anhydrous (a result of super heating) and hydrous (from normal drying) the conditions under which the stain formed can be interpreted.

Savings of 10-50 person-REM and \$600,000 in costs are estimated when this system is used.



Left: Synthetic RCS, dried at 100 degrees C. Then heated to dehydrate. (Fluorescence spectrum only)

Right: Synthetic RCS, dried at 100 degrees C. Then heated to dehydrate, and re-hydrated with liquid water. Boric acid Raman spectrum is clearly detected.



The InSITE™ Remote Spectroscopy System



Optional Laboratory Configuration

SPECIFICATIONS

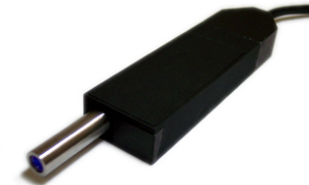
Fully Integrated Raman Analyzer with narrow linewidth, frequency stabilized laser, high resolution spectrograph, portable design.

- Excitation Source:
Divya™ 785 nm or 808 nm, Frequency Stabilized, Narrow Linewidth Diode Laser Standard
Laser Power: 150 to 200 mW or 300 to 400 mW
Line width: 0.5 to 1 cm⁻¹
Laser output: Fiber Coupled 100 μm fiber, 0.22 NA
- Laser Lifetime: >10,000 hours estimate
- Spectrometer Type: f/4 Crossed Czerny-Turner
Resolution: <6 cm⁻¹
Spectral Range: 200 cm⁻¹ to 2400 cm⁻¹
- CCD Linear Array Detector
Pixel Size : 14 μm x 200 μm (2048 Pixels)
12 Bit Digitization
USB Interface or RS-232
- System Software
Data Collection Software
Data Files Can Be Exported Into ASCII, Dat, or Bitmap
Automated Substance ID
- Operating Environment: 10 – 40 ° C

What Is Raman—How does it work?
Raman spectroscopy takes advantage of the inelastic scattering of monochromatic radiation by molecules. During this process energy is exchanged between the photon and the molecule such that the scattered photon is of higher or lower energy than the incident photon. The difference in energy is made up by a change in the rotational and vibrational energy of the molecule. Each substance has a different Raman spectral “signature”. Sir C.V. Raman was awarded the Nobel price for Physics in 1930 for his discovery of the Raman phenomena, but it was not until the recent development of high quality lasers, such as the Divya™, as monochromatic light sources that Raman spectroscopy has become a routine analytical technique.

The InSITE™ Remote Raman Probe

- Sampling Head:
Black Anodized Aluminum Probe
Stainless Steel Probe Tip
- Working Distance from Probe to Sample:
6 mm (0.3 NA) Standard
3 mm (0.55 NA), 10 mm (0.3 NA) Optional
 - Operating Environment: Up to 170 °F
 - Fiber cable length: 100 ft



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