Raman & Luminescence Spectroscopy System

(V760, D760, P760)

Quantum Design's new Spectroscopy System combines Raman and Photo-Luminescence spectroscopy with optical sample imaging in the variable temperature and magnetic field environment of the PPMS®. Using this "turn-key" system, gaseous, liquid and solid materials, in bulk or thin film form, may be investigated. Raman spectroscopy is a non-destructive spectroscopic technique used to identify and explore vibrational, rotational, and other excitation modes in a sample. Raman spectroscopy is commonly used to identify crystalline materials by measuring their specific Raman "fingerprint." This is done by measuring the inelastic scattering of light. In crystalline samples, the inelastic gain or loss of energy produces narrow discrete peaks known as Stokes and Anti-Stokes peaks, respectively. Glasses, in contrast, have broad vibrational spectra that in turn give rise to broad Raman spectra. When using the versatile PPMS Spectroscopy System, the study of spin-lattice coupling in strongly correlated oxides as a function of temperature and magnetic field is made easy through the highly automated MultiVu interface.

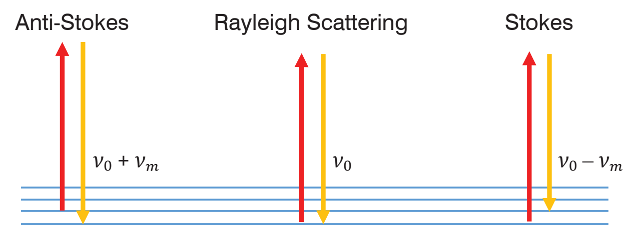

Figure 1: Diagram showing the Stokes and Anti-Stokes wavelength changes

Figure 2: Raman and Luminescence System

Optical Microscope:

- *Integrated Optical Imager*
- *Integrated LED illuminator*
- *Resolution: 5 micrometer or better*
- *Magnification: 5x*
- *Filed of View: 2 mm*

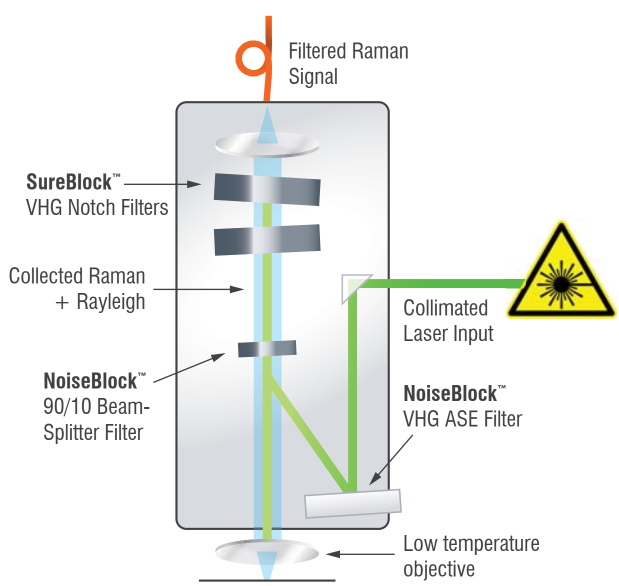

Figure 3: Internal diagram of Raman Spectroscopy Laser System showing placement of Filters in optical path.

☑PPMS ☑EverCool ☑DynaCool ☑VersaLab

Features

- Various Wavelengths (532, 785 and 850 nm)
- Tilt and Tip control
- Volume Holographic Grating
- Ultra-Narrow-Band Notch Filter
- Compact Footprint

Applications

- Structural Identification
- Impurity Detection
- Crystallization Analysis
- Bulk and Thin Film
- Stokes and Anti-Stokes Signal

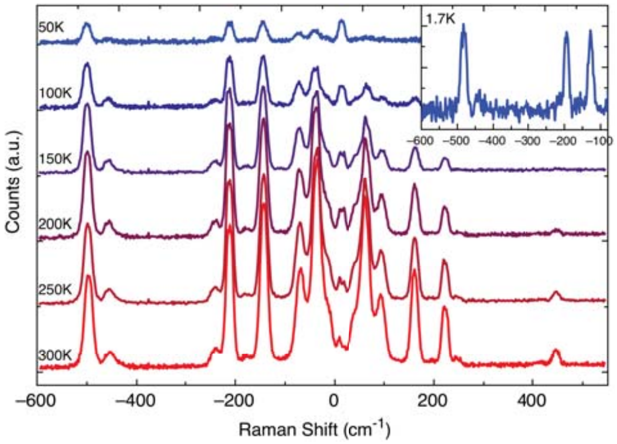

Figure 4: Raman spectra of sulfur using Optical Multi-Function probe (OMFP) in PPMS and DynaCool. Main plot shows data taken in PPMS at temperatures from 300 to 50 K. Inset shows data taken in DynaCool at 1.7 K with background removed for clarity.

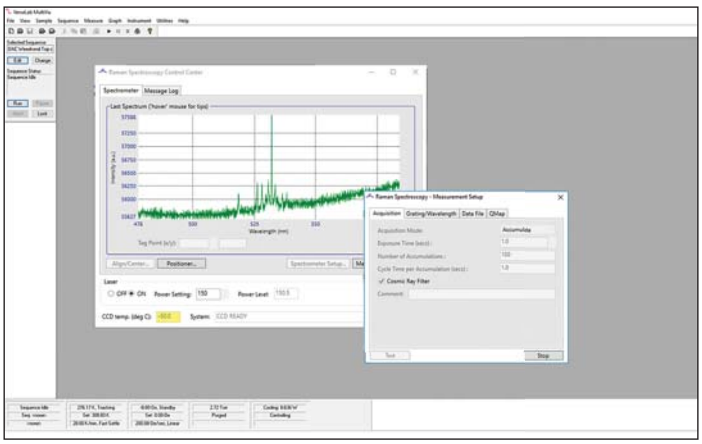

Figure 6: Raman Spectroscopy software showing data taken of sulfur standard.

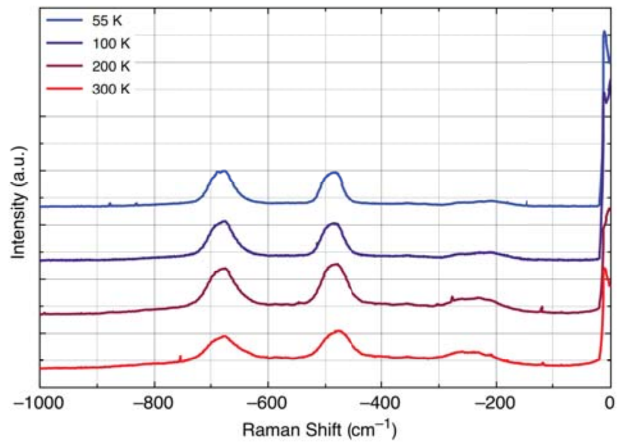

Figure 5: Raman spectra of TiO2 Rutile phase taken in a VersaLab using Optical Multi-Function Probe

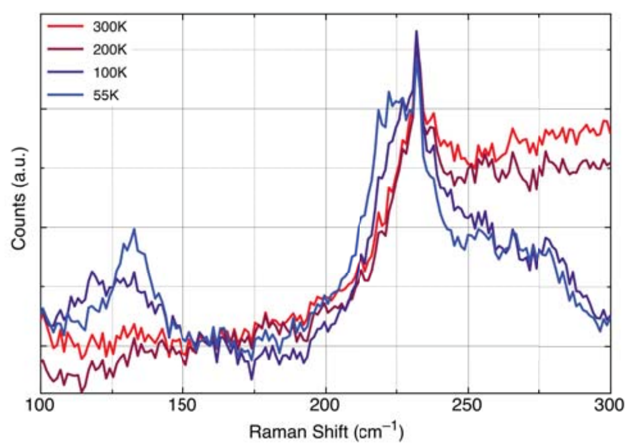

Figure 7: Raman spectra of YBCO thin films supplied by M. B. Maple of UCSD. Data was normalized to 160 cm^{-1} to show the change in spectral weight with the onset of superconductivity

References:

- Matthias Hudi, et al., PPMS-Based set-up for Raman and Luminescence spectroscopy at high magnetic field, high pressure and low temperature. EPJ Techniques and Instrumentation, December 2015, 2:3
- Cal Tech Raman Spectra Library: HTTP://rruff.info
- J T Carrier, et al., Low Frequency/THz Raman TM Spectroscopy: Using Structural Information for Material Identification. http://ondax.com/wp-content/uploads/2014/01/Ondax-SciX-Presentation-October-2013.pdf

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