Precision and Stability in Raman Spectroscopy with DPSS Laser

Raman spectroscopy, is a non-invasive chemical analysis method that allows us to know the transient states of vibrations and rotations of a molecule excited by a monochromatic light source. The Raman spectrum enables a unambigous identification of a molecule or compound.

When a sample is illuminated by a monochromatic source, a large portion of the incident photons are re□emitted at the same wavelength and retain the same energy level; this type of scattering is known as elastic scattering or Rayleigh scattering. However, another phenomenon occurs: a small portion of the incident photons can have their energy modified by the sample, resulting in an inelastic scattering. This phenomenon is called Raman scattering and was first discovered in 1928 by Chandrashekhara Venkata Raman.

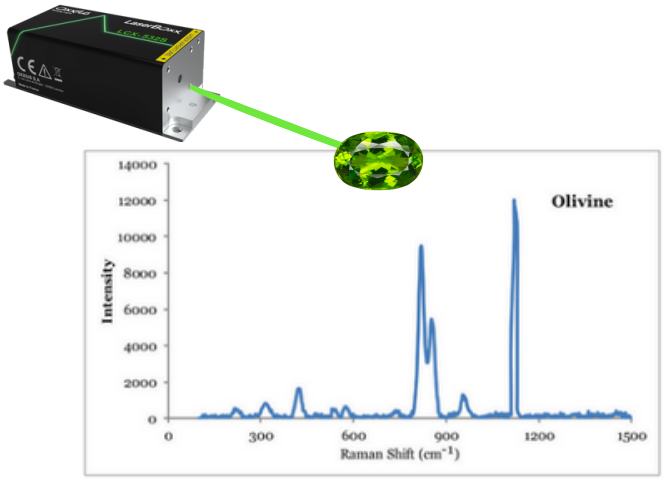

Figure 1: Schematic Representation of Raman Spectroscopy

Single-Frequency Laser for Raman

Oxxius' DPSS lasers are assembled using a unique technology developed by Oxxius and protected by more than ten patents. The optical elements are assembled into a monolithic resonator with very low optical loss. The contact forces between the end faces of two crystals create a glue-free bond that is extremely robust over time and resistant to temperature variations, while being insensitive to mechanical vibrations. Dielectric mirrors coated on the ends of the crystals complete this monolithic assembly without any moving parts, providing excellent long-term robustness.

This unique technology enables the DPSS lasers in Oxxius' SLM range to achieve exceptional wavelength stability. This stability is crucial for Raman spectroscopy, where even minimal fluctuations can compromise measurement accuracy.

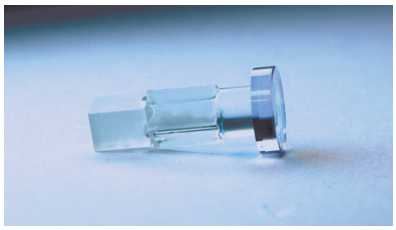

Figure 2: Oxxius Monolithic Cavity

The narrow spectral linewidth of Oxxius lasers allows for the resolution of very close Raman bands, thereby improving the resolution and quality of the obtained spectra.

Another major advantage of this technology is wavelength stability upon restart. Thanks to the monolithic assembly, Oxxius DPSS lasers restart with a wavelength shift of less than 1 pm.

This feature ensures that Raman measurements can be resumed with the same precision, even after an interruption, which is essential for applications requiring high continuity and repeatability.

Learn More About Oxxius Monolithic DPSS Laser

The LCX-532S for high-resolution spectroscopy

The LCX-532S is a diode-pumped solid-state (DPSS) laser that offers a high resolution for Raman spectroscopy of inorganic samples. Thanks to the unique technologie of DPSS of Oxxius the LCX-532S benefit of an ultra-narrow linewidth of less than 1 MHZ. Additionally, it boasts a wavelength stability of less than 1 pm.

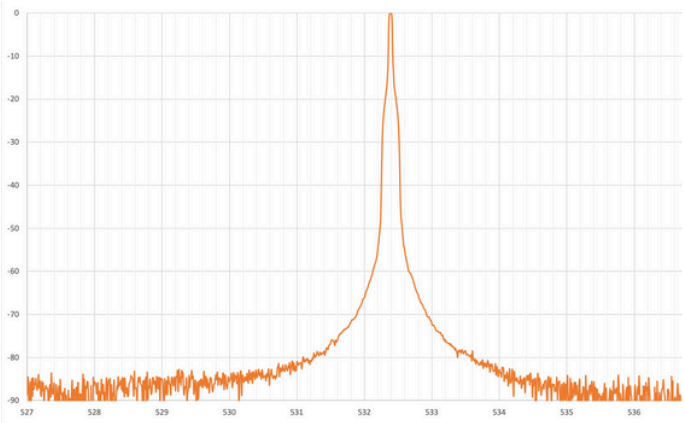

Figure 3: Spectral Fineness of the Laser at 532 nm

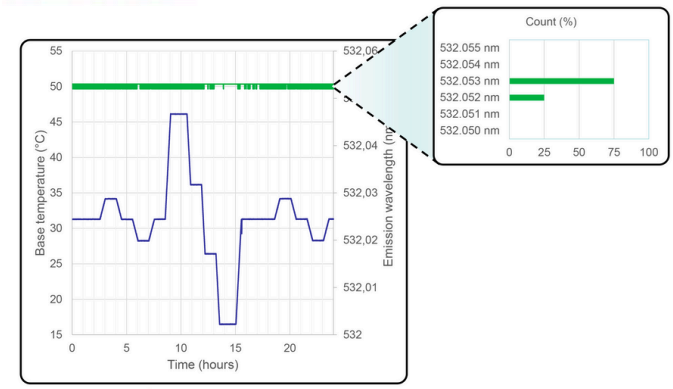

Figure 4: Wavelength Stability as a Function of Temperature

The 532S lasers are available up to 500 mW, and benefits from an exceptional power stability against temperature variations. This stability ensures consistent performance and accurate measurements, making it highly reliable for applications requiring precise and repeatable results. The robust design minimizes power fluctuations, even under varying environmental conditions, which is crucial for maintaining the integrity of Raman spectroscopy data.

Download the LCX-532S Datasheet

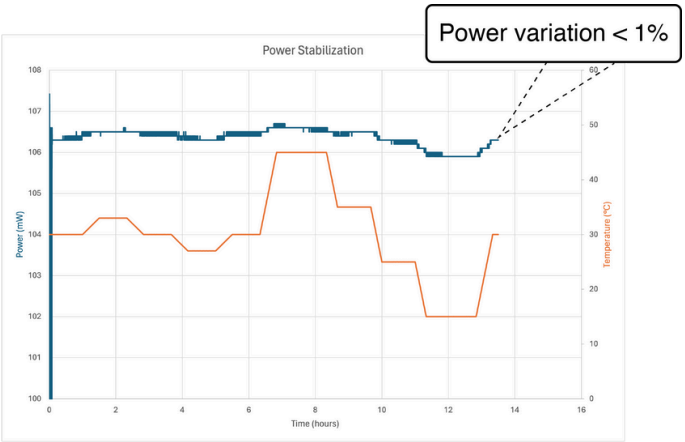

Figure 5: Power Stability of the Laser Under Temperature Fluctuations