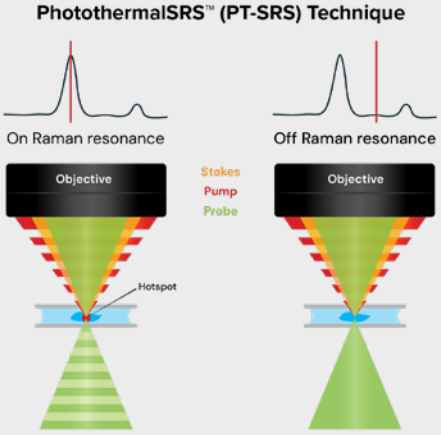
PHOTOTHERMAL
SPECTROSCOPY CORP

stRAMos™

Photothermal Stimulated Raman microscope

- Highest sensitivity measurements, with an up to 10x improvement over conventional SRS techniques
- Highest chemical imaging spatial resolution ≤300nm
- Ultrafast hyperspectral imaging with unique fast laser tuning of up to 25ms per wavenumber
- Real-time live cell imaging and sub cell imaging
- 3D volumetric imaging with sub-micron axial resolution for depth resolved chemistry
- Robust design for ease of use, with no manual laser alignment
- Multimodal imaging capabilities with correlative O-PTIR, Fluorescence microscopy & spontaneous Raman Spectroscopy



PhotoThermalSRS. A modulated, chemically specific hotspot occurs only at the overlap of pump and Stokes beams on a Raman resonance peak.

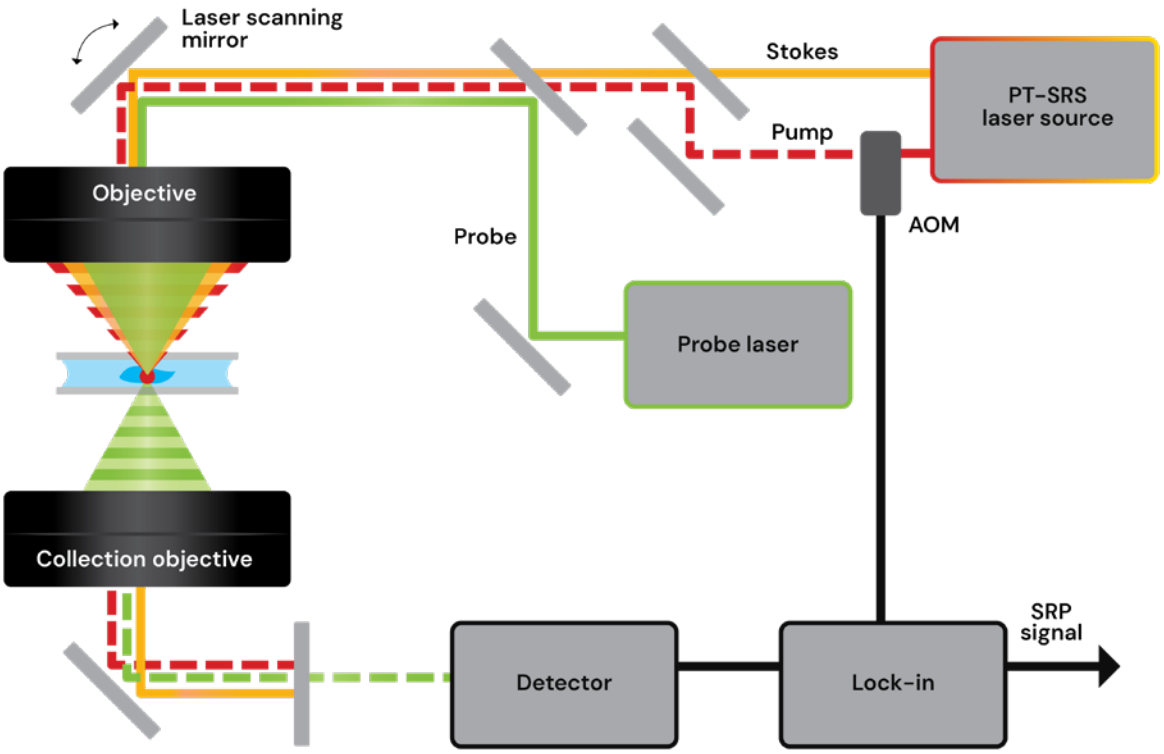
stRAMos™
powered by PhotoThermalSRS™

The stRAMos Photothermal Stimulated Raman Microscope uses the new breakthrough technique of PhotoThermalSRS™ (PT-SRS) to deliver the combined highest sensitivity and highest spatial resolution chemical imaging in a single system with high speed, laser-scanning based imaging and advanced microscopy characterization capabilities – all in a robust, easy to use platform.

The SRS microscopy user community understands the importance of sensitivity. With that in mind, we productized PT-SRS to achieve a 10x sensitivity boost and a spatial resolution ≤300nm, while delivering robust, easy to use, label-free vibrational microscopy for advanced life science characterization on living cells, bio-molecular structures and tissues.

The stRAMos microscope also uniquely combines many optional multimodal capabilities into a single system. stRAMos supports, the combination of PT-SRS with Optical Photothermal Infrared Spectroscopy (O-PTIR) to deliver submicron IR, widefield Epi Fluorescence imaging and spontaneous Raman spectroscopy, enabling the most thorough, correlative chemical characterization of your sample.

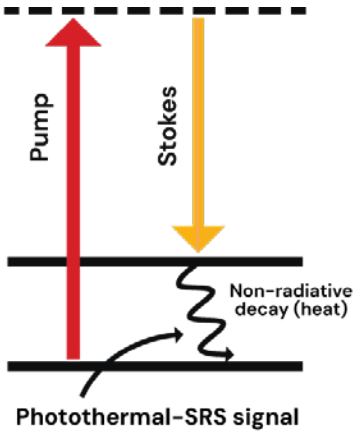
The PhotoThermalSRS™ technique



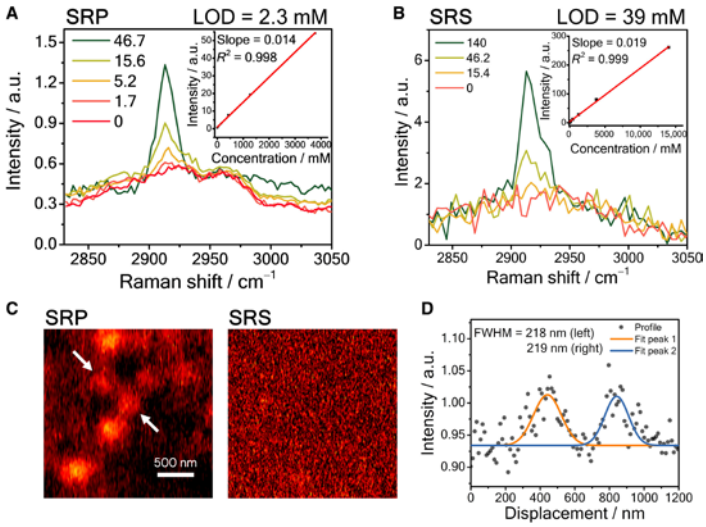
- PT-SRS laser source provides modulated Pump and Stokes signal.
- Separate probe laser utilizes the same beam path to the sample.
- High NA objectives focus the beams onto the region of interest.
- Chemical selectivity comes from tuning the Pump–Stokes frequency difference.
- The probe laser senses the temperature-induced refractive-index drop at this hot spot.

Highest sensitivity SRS

PhotoThermalSRS (PT-SRS) is a new, advanced method of performing Stimulated Raman Scattering (SRS), in which the heat dissipated from the SRS measurement is detected to form the analytical signal. (Conventional SRS measurements do not detect this signal).



Similar to the SRS signal, the photothermal signal is proportional to both band (peak) strength and local concentration, but with the added benefit that the PT-SRS signal provides a higher (up to 10x) sensitivity measurement than SRS by virtue of the ultra-low noise, probe beam, a CW 532nm laser. Additionally, photothermal detection delivers advantages in experimental flexibility (long working distance objective) and use of more robust, compact fiber lasers, instead of bulky and complex solid-state lasers.



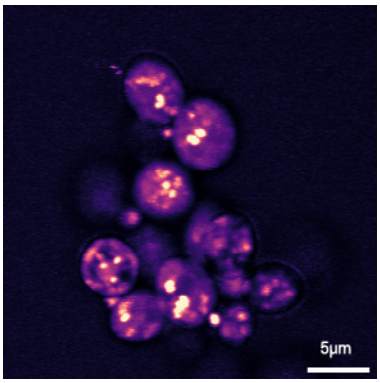
Zhu et al., Sci Adv. 9 eadi 2181 (2023) 27 October 2023

Top Row: Limit Of Detection (LOD) comparisons between PT-SRS (referred to as SRP in the figure) and traditional SRS, demonstrating >10x improved SNR. Bottom Row: Comparison of 100nm PMMA beads at imaged 2950cm^{-1} - Same laser average power & Field of View, showing how improvements in SNR and spatial resolution lead to the clear imaging of even 100nm PMMA beads

Bringing new capabilities to microscopy

High Speed, Label Free Imaging for Molecular Dynamics

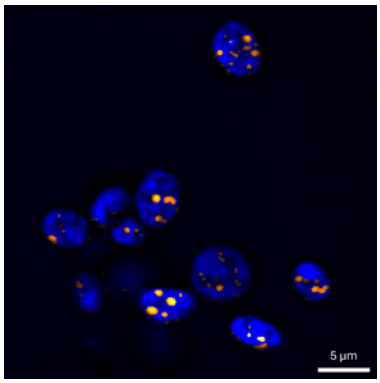
PT-SRS provides high speed microscopy (multiple frames per sec) to dynamically study biomolecular processes.



High speed single wavelength imaging of cells. Image of lipids measured at 2850cm^{-1}.

Ultrafast live Cell Hyperspectral Imaging and Spectroscopy

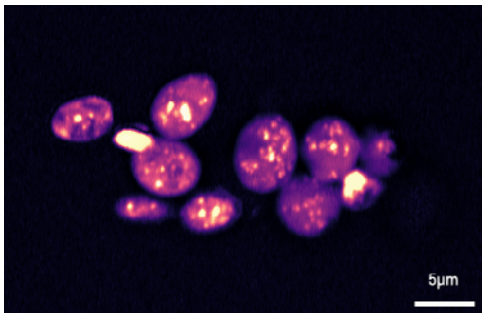
PT-SRS enables ultrafast full hyperspectral imaging across the entire spectral range, including the C-H, silent and fingerprint regions.



High speed single wavelength imaging of cells highlighting lipids, measured at 2850cm^{-1}.

Label Free 3D Volumetric Imaging for Depth Resolved Chemistry

PT-SRS extends chemical contrast into 3 dimensional chemical maps, providing the highest chemical (axial) sensitivity and image sectioning.



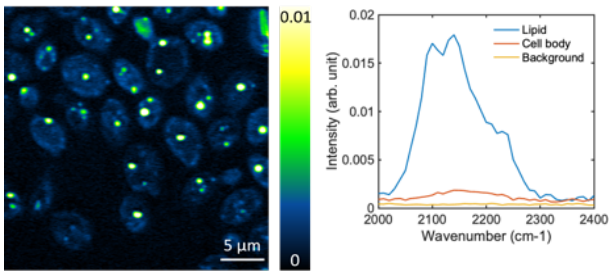
3D Volumetric imaging of proteins and lipids in a yeast cell. Composite image of biomolecule at multiple depths measured at 2850cm^{-1}.

Applications overview

stRAMos provides unique chemical imaging for a wide range of life science research areas, including:

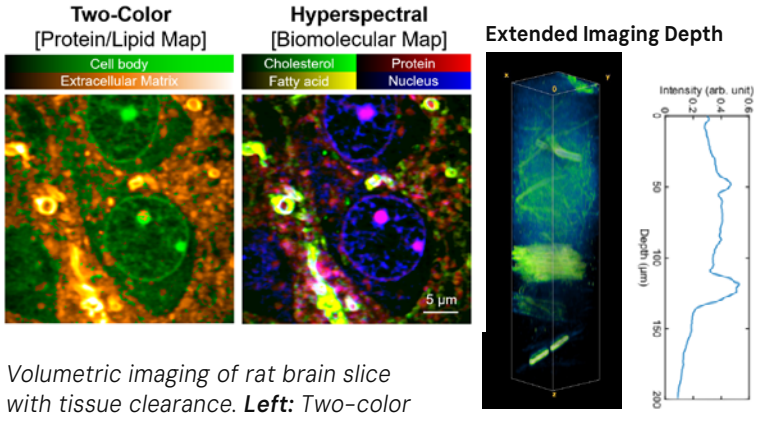
- Live cell characterization
- Label-free tissue imaging with 3D depth profiling
- Characterization of bio-molecular structures

Live cell imaging and spectroscopy



High resolution PT-SRS chemical imaging and hyperspectral derived spectroscopy of: 90% D2O labeled fungal cell, 2170cm^{-1}.

Histology of urea-cleared brain tissues



*Volumetric imaging of rat brain slice with tissue clearance. **Left:** Two-color histology. **Middle:** Hyperspectral image of biomolecular decomposition in C-H region. **Mid right:** Depth-resolved imaging of urea-cleared rat brain at 2930cm^{-1}. **Far right:** Average intensity of each frame in the depth-resolved image.*

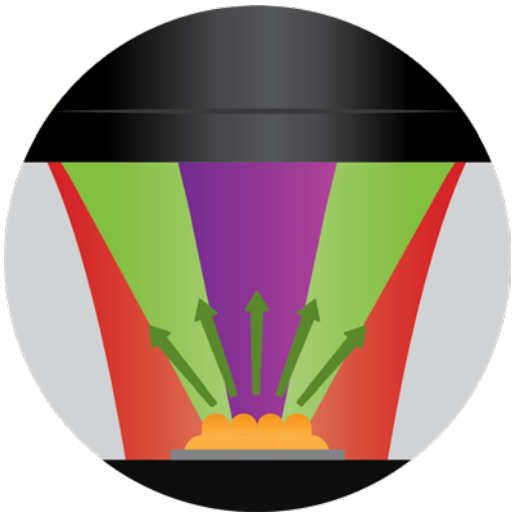
Image & Data credit: Xiaowei Ge, Boston University

Multimodal imaging with correlative O-PTIR and Fluorescence Microscopy

The stRAMos system uniquely combines optional multimodal capabilities into one platform. In a combined system, the stRAMos can support PhotoThermalSRS, Optical Photothermal Infrared Spectroscopy (O-PTIR) for submicron IR, Widefield Epi Fluorescence microscopy and spontaneous Raman spectroscopy.

For more information about the data and system specifications, please visit our website.

www.photothermal.com/products/stramos



stRAMos - Key system specifications

Spatial resolution	≤300nm spatial resolution in imaging, line scans and single point mode data collection demonstrated on stRAMos test sample.
Spectral range	Fiber laser has a spectral range of approx. 3100 - 700cm^{-1}
Spectral resolution	<12cm^{-1} Defined by the integrated fiber laser.
Imaging wavenumber tuning speed	<100ms (depending on how close the wavenumbers are)
Fiber laser wavelength & power	**Pump:** Tunable, 780-980nm, Average power, 100-250mW **Stokes:** Tunable, 1025–1055nm, Average power, >300mW
Fiber Laser pulse width & repetition rate	Pump, 7-10ps, Stokes, 2-3ps Repetition Rate, 40MHz

PHOTOTHERMAL SPECTROSCOPY CORP

325 Chapala Street, Santa Barbara, CA 93101 (805) 845-6568 info@photothermal.com www.photothermal.com

© 2025 Photothermal Spectroscopy Corp. All rights reserved.
stRAMos™, PhotoThermalSRS™ and featurefindIR™ are trademarks of Photothermal Spectroscopy Corp.

For full references to the data highlighted in this document, please refer to our website.

DS7 - Oct 2025