



RF-Coherent Raman Spectroscopy (rfCRS)

Raman spectroscopy is a valuable tool for the characterization of molecules, but traditional methods rely on incoherent scattering of light and consequently suffer from poor sensitivity. Although coherent Raman techniques have been developed to address this problem, only surface-enhanced Raman scattering (SERS) can reach sensitivities approaching single molecule. Unfortunately, as SERS requires specialized metal surfaces and painstaking sample preparation, it is not suitable for many applications.

Researchers in the Department of Electrical and Computer Engineering at Colorado State University are developing an entirely new approach to Raman spectroscopy. Dubbed “radio frequency coherent Raman spectroscopy” (rfCRS), this technique utilizes advanced electronic signal processing to detect a small continuous frequency shift from Raman-light interactions.

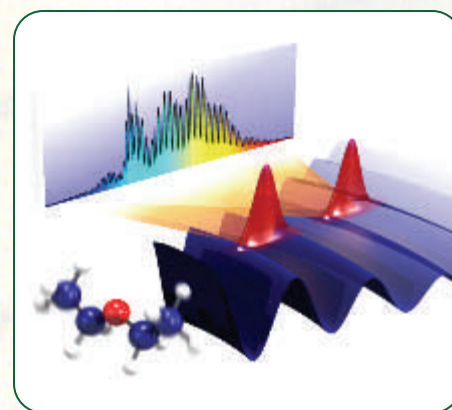
This technique offers several advantages over conventional Raman techniques, including detection limits comparable to SERS and orders of magnitude above other techniques. However, unlike SERS, no specialized sample preparation is required, there is minimal non-resonant background interference, remote detection is still highly sensitive, and the signal strength is independent of the analyte concentration (enhancing signal-to-noise). Furthermore, the optical setup is simple and easy to use, and no optical spectrometer is required.

This technology is of interest to any company that performs chemical analysis (e.g. forensics, remote sensing, biomedical microscopy, and many others). In particular, rfCRS offers a competitive advantage for applications involving: the remote and sensitive detection of chemical agents (including explosives and chemical agents), carbon quantification, in-vivo microscopy, pathology, and biomarker detection.

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Patent Information
Patent pending.

Inventor Information
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Features and Benefits

- Entirely new type of Raman spectroscopy; more sensitive, better signal-to-noise, easy to use.
- Detection limits are 1,000 to 1,000,000 times better than other methods (excluding SERS).
- Detection limits similar to SERS, but no metal surfaces or specialized sample preparation required.
- Suitable for remote detection (e.g. explosives, pathogens, chemical agents, etc.)
- Applications in chemical analysis and biomedical microscopy (including in-vivo).

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