NISTTech

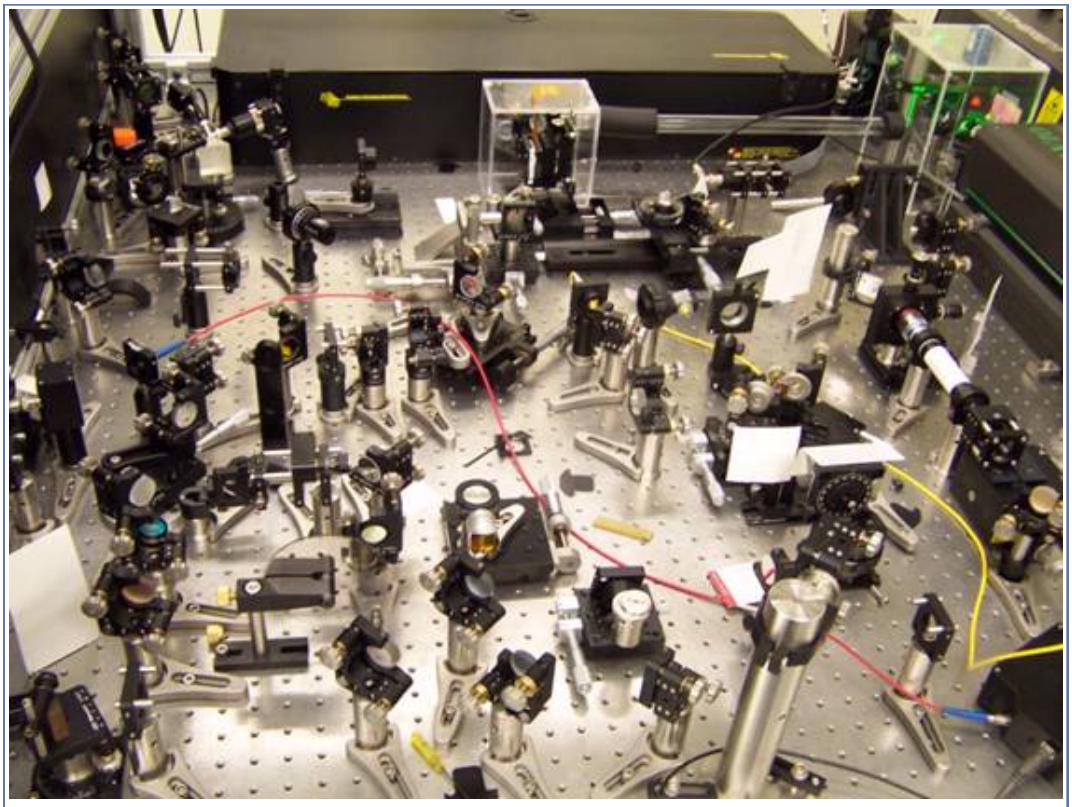
Non-Linear Raman Image Contrast Enhancement

Increase signal-to-noise ratio for non-invasive and quantitative chemical microscopy

Description

This microscope imaging technique dramatically enhances the chemical contrast of broadband non-linear Raman images by removing unwanted background signals and retaining resonant signals of interest. The approach uses pulse shaping and closed-form signal analysis to enhance image contrast of broadband non-linear Raman spectroscopy, such as coherent anti-Stokes Raman scattering (CARS) microscopy. Non-resonant background signals are suppressed by a compact pulse shaper to improve sensitivity and signal-to-noise ratio, thus providing high-contrast and high-sensitivity broadband non-linear Raman microscopy.

Images



View of device Credit: NIST

Close-up of device Credit: NIST

Applications

- **Enhanced chemical contrast in medical devices**
  Raman spectra are used in disease diagnosis. Nonlinear Raman scattering is more efficient and can lead to the development of

diagnostic tools based on Raman spectroscopy imaging

Advantages

- **Improved sensitivity and signal-to-noise ratio**
  Suppresses non-resonant background (NRB) in broadband coherent anti-Stokes Raman scattering (CARS) microscopy

Abstract

The invention disclosed herein is a novel and simple method of suppressing non-resonant background (NRB) in broadband coherent anti-Stokes Raman scattering (CARS) microscopy to improve sensitivity and signal-to-noise ratio.

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Citations

1. Y. Jong Lee and M.T. Cicerone. Vibrational dephasing time imaging by time-resolved broadband coherent anti-Stokes Raman scattering microscopy. Appl. Phys. Lett. 92, 041108 (2008). doi:10.1063/1.2838750
2. Y.J. Lee and M.T. Cicerone. Single-shot interferometric approach to background free broadband coherent anti- Stokes Raman scattering spectroscopy. Optics Express, Vol. 17, Issue 1, pp. 123-135 (2009). doi:10.1364/OE.17.000123
3. Y.J. Lee and M.T. Cicerone. Pulse shaping for background free broadband CARS. Proceedings of SPIE, Vol. 7183, pp. 71830Y-71830Y-8, 2009. doi: 10.1117/12.809102
4. Y.J. Lee, Y. Liu, and M.T. Cicerone. Characterization of three-color CARS in a two-pulse broadband CARS spectrum. OPTICS LETTERS, Vol. 32, No. 22, November 15, 2007.

Related Items

- MERWYN Business Simulation Report

References

- U.S. Patent #8,120,772 issued 02-21-2012, expires 01/03/2033
- Docket: 08-035

Status of Availability

active patent and available for licensing

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