

# Stimulated Raman Loss Spectroscopy: Collinear vs Non-collinear beam geometries

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Raman spectroscopy is a valuable analytical technique to reveal molecular vibrations of chemical and biological specimen, enabling the accessibility of a large amount of information about molecular structures and dynamics, the magnitude of the bond strengths, the nature of the chemical environment, or even the characteristics of the electronic excited state. However, the spontaneous Raman scattering is very weak (approximately 1 in 10 millions) compared with the Rayleigh scattering, and the most molecules produce the fluorescence background signals that can easily overwhelm the real Raman signal. Recently, a coherent Raman spectroscopy such as coherent anti-stokes Raman scattering (CARS), and stimulated Raman scattering (SRS) has been proposed for a new method to overcome these problems.

In here, we have demonstrated the stimulated Raman loss (SRL) spectroscopy. The SRL spectrum is given by the ratio of the probe spectrum with and without the Raman pump. The SRL signal is given by:  $SRL = (\text{Raman probe with Raman-pump-on})/(\text{Raman probe with Raman-pump-off})$ . In our experiment, a spectrally narrow pump (centered at 1025 nm) and a broad anti-Stokes (centered at 900 nm) beams are used for the SRL measurement. We examine SRL spectra of four different liquid solvents (benzene, toluene, cyclohexane, and acetonitrile), showing their characteristic strong Raman peaks in the spectral range from 500  $\text{cm}^{-1}$  to 1600  $\text{cm}^{-1}$ . We perform the SRS loss dependency of the experimental conditions; the Raman pump- and probe-power, the sample concentrations, and the beam geometry (collinear vs non-collinear). Our result indicates that the SRS spectroscopy can be used a quantitative and qualitative analytical method like to the spontaneous Raman spectroscopy. More details on our SRS experiment will be discussed in the poster session.