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【Speciality】 Molecular Spectroscopy

【Keywords】 Coherent Raman Spectroscopy, CARS,
Microspectroscopy, Molecular spectroscopic
imaging

【 Research Subject 】 Dynamic Multi-photon Spectroscopic Imaging of
Intracellular Biomolecules Using a White Laser Source

Research Group Activity

Development of CARS (coherent anti-Stokes Raman scattering) microspectroscopy using a white laser source

The diagram illustrates the experimental setup for CARS microspectroscopy. A Ti:sapphire laser provides the pump and Stokes beams. These beams pass through a photonic crystal fiber and a narrow-band pass filter. They are then coupled into a fiber coupler. The pump beam passes through a short-pass filter and a notch filter before reaching the sample on a piezo stage. The Stokes beam is also directed towards the sample. The scattered light is collected and passes through a fiber coupler, a notch filter, and a NIR filter. The signal is then detected by a polychromator and a CCD camera. The diagram also shows the Raman shift and the Stokes and anti-Stokes frequencies.

Molecular spectroscopic imaging using CARS microspectroscopy

The figure displays a CARS spectrum and three corresponding CARS images of a pollen grain. The spectrum shows intensity (a.u.) versus Raman shift (cm⁻¹) with peaks at approximately 3000, 2900, and 1500 cm⁻¹. The images show C-C str (cyan), C=C str (yellow), and C-H str (red) with a 5 μm scale bar.

Molecular spectroscopic imaging of a pollen grain

Development of CARS spectroscopy using a microchip laser source

The photograph shows a microchip laser source generating a white laser beam. The beam is visible as a bright green line against a dark background.

White laser generation using a microchip laser source

In vivo measurement of biomedical tissues by coherent Raman endospectroscopy

The diagram illustrates the *in vivo* measurement of biomedical tissues by coherent Raman endospectroscopy. A laser source provides the pump and Stokes beams. These beams pass through a white laser generation stage. The resulting white laser beam is directed towards a target tissue. The scattered light is collected and passes through a spectrum stage. The resulting spectrum is then used to identify a target. The final output is an image of the target tissue. The diagram also shows a new scheme of a CARS process.

CARS endospectroscopy