

RAPID DUAL-COMB COHERENT RAMAN SPECTROSCOPY IN THE HIGH-WAVENUMBER REGION

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Delay-spectral focusing dual-comb coherent anti-Stokes Raman spectroscopy is proposed and performed, realizing a 40000 spectra/s acquisition rate, which is the fastest Raman spectral detection in the high-wavenumber region up to the present. The spectral resolution ($\sim 10 \text{ cm}^{-1}$) and the signal-to-noise ratio (~ 260) keep stable along the detection process.

This novel spectroscopic technique avoids the invalid scanning time wasted in waiting for the superposition in time of the dual-comb pulses by actively modulating the repetition frequency difference and thus the relative delay. An intracavity electro-optic modulator (EOM), with high modulation amplitude and response frequency, is applied for fast repetition frequency modulation. Delay-spectral focusing method also helps to obtain the high-wavenumber region spectrum, which is difficult to realize for previously-used Fourier transform CARS (FT-CARS) due to the intrinsic coherence of ultrabroadband pulses. This technique shows huge potentials in which both high speed and high-wavenumber region detection are required, such as fast microspectroscopic imaging and flow cytometry.

