NONLINEAR FEMTOSECOND VIBRATIONAL SPECTROMETER

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A novel apparatus for vibrational spectroscopy at surfaces and in the bulk is being jointly developed by University of Illinois at Urbana-Champaign and Clark MXR, Inc. This device combines two nonlinear vibrational spectroscopy techniques: IR-visible sum frequency generation (SFG) and coherent anti-Stokes Raman spectroscopy (CARS) in one user-friendly system. SFG is known to be highly surface specific, while CARS is capable of probing the bulk under the surface. In many systems of practical interest these two techniques can successfully complement each other. Both are being offered in broadband multiplex configuration with instantaneous recording of the spectrum by a CCD detector. Similarities between the two allow for sharing of the laser source, sample positioner, detection system and most of beam-steering optics. Our approach results in substantial cost-savings for the end user. This SFG/CARS spectrometer is equipped with the sample positioner specifically designed to quickly interchange sample holders and cells without the need for complicated and time-consuming optical realignment. This particular feature is intended to facilitate sharing of the device between several users and research groups with minimal downtime. Switching between CARS and SFG is just as straightforward. The device is simple enough to be operated by a graduate student. Training program for the end-user is being offered. This system is the first commercially-available SFG/CARS spectrometer in an affordable state of the art package for use in nonlinear spectroscopy.