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Vibrational Spectroscopy and Symmetry Specific Vibrational Energy Relaxation of Ethanol Molecule: A Study with Sum Frequency Generation and Photoacoustic Stimulated Raman Spectroscopy HONG-FEI WANG[1], Institute of Chemistry, Chinese Academy of Sciences, SHI-LIN LIU[2], Department of Chemical Physics, University of Science and Technology of China — Orientational analysis of Sum Frequency Generation Vibrational Spectroscopy (SFG-VS) of un-deuterated ethanol indicated that the assignment of its C-H stretching vibrations in the literature was troublesome. The assignments were clarified using deuterated ethanols with their SFG-VS spectra at the vapor/liquid interface, and photoacoustic stimulated Raman spectra in the vapor phase. Comparison of SFG-VS spectra at vapor/liquid interface, infrared and Raman spectra in liquid phase, and photoacoustic stimulated Raman spectra in vapor phase of both un-deuterated and deuterated ethanol at room temperature indicated that the vibrational energy relaxation dynamics of ethanol molecule is significantly different for its symmetric and asymmetric C-H vibrational modes. These results showed that surface nonlinear spectroscopic methods can be used as effective tools for interrogating spectroscopy of molecules in bulk and vapor phases.

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