

Abstract Submitted
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Sum-frequency spectroscopic study of optical phonons in alpha-Quartz¹ WEI-TAO LIU, Y. R. SHEN, University of California at Berkeley — Sum-frequency vibrational spectroscopy (SFVS) was used to probe optical phonons of alpha-quartz. As a second-order nonlinear optical process, SF generation is allowed only with phonon modes that are both infrared and Raman active. This, together with dependences on input/output polarization combination and crystal orientation, enabled us to examine more closely the symmetry properties of such phonons. In the experiment, a tunable infrared ($\sim 7\text{-}14\mu\text{m}$) and a visible (532nm) input beam were overlapped in a crystalline alpha-Quartz, and the SF output in the reflected direction was detected. Resonant enhancement of the output when the infrared frequency scanned over phonon modes yielded the phonon spectra. Analysis of the spectra with the help of existing infrared and Raman spectra of alpha-quartz provides concrete information about the observed phonon modes.

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