

STIMULATED RAMAN SCATTERING IN KXe: A NOVEL SPECTROSCOPIC TOOL

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Stimulated Raman Scattering (SRS) has been observed for the first time in any alkali-rare gas diatomic molecule, and the observed spectra provide a powerful tool for elucidating interatomic spectra. Specifically, laser pump-probe experiments in which the K vapor/Xe mixtures are excited with a narrowband dye laser radiation near the K D_2 line yields strong amplification of a probe pulse located 50-55 cm^{-1} to the red of the K D_1 line, a difference that is close, but not equal to the $4^2P_{3/2}$ - $4^2P_{1/2}$ spin-orbit splitting of K. As shown by the representative data in the figure, sweeping the pump wavelength to the red, results in the SRS gain spectra spectrum (shown by the probe amplification spectra), tracking the movement of the pump. We interpret these data in terms of a molecular SRS process in which the Raman shift is associated with the KXe $B^2\Sigma_{1/2}^+$, $A^2\Pi_{3/2}$, $A^2\Pi_{1/2}$ - $X^2\Sigma_{1/2}^+$ difference potentials at differing values of the internuclear R. Another unique aspect of this aspect of this process is that the Raman process originates with the K-Xe collision pairs in the thermal continuum of the ground state. Consequently, $B^2\Sigma_{1/2}^+$, $A^2\Pi_{3/2}$, $A^2\Pi_{1/2}$ interatomic potentials at large R can be determined by comparing experiment with calculations of $B^2\Sigma_{1/2}^+$, $A^2\Pi_{3/2}$, $A^2\Pi_{1/2}$ - $X^2\Sigma_{1/2}^+$ Frank-Condon integrals and quasistatic line-broadening theory.

