

PURE-ROTATIONAL RAMAN AND ELECTRONIC-RAMAN SPECTRUM OF NITRIC OXIDE

AMAN SATIJA, ROBERT P. LUCHT, *Mechanical Engineering, Purdue University, West Lafayette, IN, USA.*

Nitric Oxide (NO) is a combustion pollutant known for its role in the formation of photochemical smog. Nitric oxide is also interesting from the viewpoint of fundamental spectroscopy since it has two closely spaced ground electronic states. Consequently, in addition to pure-rotational Raman spectrum, NO also exhibits electronic-Raman spectrum near 120 cm^{-1} . We applied a dual-pump combined CARS system (DPCCS) to investigate the spectrum of NO. In a DPCCS, in contrast to a typical pure-rotational CARS system, all beams have different wavelengths. This allows us to preferentially suppress Q or S branch Raman transitions and investigate the polarization character of a target molecule, in this case NO. Theoretical spectrum of NO was calculated by solving the time-dependent Schrodinger wave equation using perturbation theory. By comparing the measured and the computed spectrum we obtain the anisotropy of the polarizability tensor of NO as well as a quantitative estimate of the strength of electronic-Raman transitions. The figure in this abstract shows comparison between CARS data and calculated NO spectrum with no preferential suppression of either the Q or S branch Raman transitions. Notice the spin-splitting of the $2\ \Pi_{1/2}$ and $2\ \Pi_{3/2}$ states of NO, evident, near a Raman shift of 80 cm^{-1} .

