IR-REMPI DOUBLE RESONANCE SPECTROSCOPY OF NO-Ar AND NO-Ne COMPLEXES

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Non-resonant two-photon absorption spectroscopy has been applied successfully to the study of high lying electronic states of small molecules and Van der Waals complexes. In this contribution, we present first results of molecular beam experiments in which (2+1) resonance enhanced multiphoton ionization (REMPI) is used to detect the infrared absorption of NO containing complexes. The output of a single mode optical parametric oscillator (OPO) laser excites the first overtone of the NO two-photon chromophore near 2.7μm. Resonances are detected either through the depletion of the REMPI signal or through the detection of vibrationally excited complexes. Hot band transitions involving the NO-Rydberg states E $^2\Sigma$, (H $^2\Sigma$, H$'$ $^2\Pi$), and F $^2\Delta$ are used to detect infrared absorption bands of the NO-Ar and NO-Ne complexes. For the first time, several bands involving intramolecular bending and stretching motion have been detected as combination bands. Their positions and rotational structures are extremely sensitive to details of the two electronic potential energy surfaces of A' and A'' symmetry near the minimum. The spectroscopic results for NO-Ar are in excellent agreement with bound state calculations based on an improved ab-initio potential surface by Alexander.[a]

[a] M. H. Alexander, J. Chem. Phys. 111, 7426(1999), ibid. 111, 7436(1999).