High Resolution UV Emission Spectroscopy of CO and N_2 Excited by Electron Impact

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Photodissociation via discrete line absorption into predissociating Rydberg states is the dominant destruction mechanism of CO and other molecules in the interstellar medium and molecular clouds. Accurate values for the oscillator strengths and predissociation yields of these transitions are required for input into the photochemical models which attempt to reproduce observed abundances.

We present our latest experimental results of the electron collisional properties of CO and N_2 obtained using the 3 meter high resolution spectroscopic facility at JPL.

Medium resolution (0.031 nm FWHM) measurements of the CO (A-X) 4th Positive band system produced by electron impact excitation at 20 eV and 100 eV have been obtained in the 130 to 205 nm region (*Beegle et al.*, 1998). These spectral data were used in combination with those of *DeLeon et al.* (1988) to determine the dependence of the electric dipole transition moment (R_e) on the r-centroid. High resolution measurements (0.0034 nm FWHM) of the CO (A-X) (5,1) and (3,0) bands show excellent agreement between the observed spectra and a synthetic model developed at JPL. In addition, the excitation function of the CO (A-X) (0,1) band at 159.7 nm has been measured from threshold to 500 eV and compared to previous measurements.

A high resolution (0.0036 nm FWHM), optically thin emission study of the N_2 (c'_4 – X)(4,3) and (3,2) Rydberg bands excited by electron impact at 100 eV has been completed in the extreme ultraviolet (*Ajello et al.*, 1998). A model of the perturbed rotational line intensity distribution of the bands shows the effects of electronic state mixing between the c′ Rydberg state and the b′ valence state. By normalizing the model to the predissociation yield for $J' = 9$ measured by *Walter et al.* (1994) the laboratory spectrum has been used to determine the c′ predissociation yields for each rotational level of $v' = 3$ and 4.

References:

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