lIIG11 RESOLUTION STUDIES 01 711, AND N , IN THE ULTRAVIOLET BY ELECTRON IMPACT

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The next generation of high resolution UV imaging spacecraft arc being prepared for studying astrophysical objects. To keep pace with these technological improvements we have developed a laboratory program t o provide electron impact collision cross sections of the major molecular astrophysical diatomic molecular gases (H_2, HD, N_2, CO_2, O_2 and CO). Spectra under optically thin conditions have been measured with a high resolution ($\lambda/\Delta\lambda$ = 50000) UV spectrometer in tandem with electron i mpact collision chamber. High resolution spectra of the Lyman and Werner band systems of H_2 have been obtained and modeled. Synthetic spectral intensities based on the J-dependent transition probabilities that include ro-vibronic perturbations are in very good agreement with experimental intensities. Electron impact dissociation of H_2 is believed to be one of t h c major mechanisms leading to the observed wide profile of H Lyman-α (H Lα) from high resolution spectra of Jupiter's aurora by the Hubble Space Telescope.[2] The kinetic energy distribution of H(2p) atoms resulting from electron impact dissociation of H_2 has been measured. The distribution is based on the first measurement of the H Lyman-α (11 la) emission line Doppler profile.[3] Analysis of the deconvolved line profile reveals t h c existence of a narrow line peak (40 mÅ FWHM) and a broad pedestal base (240 mÅ FWHM). The band strengths of the electron excited $N_2(C\,^3\Pi_u - B\,^3\Pi_g)$ second positive system have been measured in th c middle ultraviolet. The relative band intensities were used to get a n improved transition probability matrix. The energy dependence of the (0,0) cross section is reported with analytic shape function for use in model calculations. At low energies (1 1-15 cV), the excitation function showed threshold effects from resonances. Wc report a quantitative measurement of the predissociation fraction O. 15 $\pm^{.01}_{.045}$ at 300 K in the $N_2 c'_4\,^1\Sigma_u^+ - X\,^1\Sigma_g^+$ (0,0) band, with an experimental determination of rotational line strengths. The coupling of t h c rotational branches is complicated by heterogeneous perturbations b y the $c_3\,^1\Pi_u$ and $b\,^1\Pi_u$ states, forcing strong departures from Honl-

London factors and distorting the P, R branches of the rotational envelope, obtained at medium resolution.

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