STUDIES OF THE TEMPERATURE DEPENDENCE AND EXCITATION OF THE PRODUCTS OF DISSOCIATIVE ELECTRON RECOMBINATION OF N_2H^+ AND HCO^+ IONS

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The dissociative recombination (DR) rate constants of N_2H^+/N_2D^+ and HCO^+ ions with electrons have been measured as a function of temperature (100 - 500 K) using the Flowing Afterglow Langmuir Probe (FALP) technique. N_2H^+ and HCO^+ ions are two of the most abundant ions detected in the interstellar medium. The results cannot be expressed either by the power law $T^{-0.5}$ of the direct DR mechanism or the power law $T^{-1.5}$ of the indirect DR mechanism. In order to further understanding of the results, a study of the vibrational state distributions of the $N_2(B^3\Pi_g)$ electronically excited products for the N_2H^+ and N_2D^+ recombinations at 100 K has been carried out using an atmospheric pressure monochromator. Comparison has been made with previous results obtained at 300 K [a]. The substantial enhancement of the vibrational level ($\nu' = 6$) detected from the N_2 B state for N_2H^+ recombination over N_2D^+ recombination is consistent with previous results and can be explained by the influence of a tunneling mechanism of DR. Funding from NASA Grant No. NAG5-8951 is gratefully acknowledged.

[a] J. M. Butler, L. M. Babcock, and N. G. Adams, Mol. Physics. **16**, 81-90 (1997).