SUB-MILLIMETER WAVE SPECTROSCOPY OF HNC PRODUCED IN AN EXTENDED NEGATIVE GLOW DISCHARGE

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We demonstrated that HNC produced in an extended negative glow discharge from a gas mixture of CH_4 and N_2 exhibited the same magnetic field dependence as ionic species, and we concluded that HNC was produced predominantly through a dissociative recombination reaction of $HCNH^+$ with electrons[b]. Okabayashi and Tanimoto[c] observed the transitions up to $J = 4 - 3$ for all the vibrational fundamentals as well as for the ground state. They found that the vibrational temperature was 230 K for the ν_2 state, while those for the ν_1 and ν_3 modes were 1300-1600 K in a glow discharge in a mixture of CH_3CN and He. In our extended negative glow discharge, the vibrational temperature was found to be about 1500 K with no distinction among the vibrational modes. We extended the measurements to higher-J(up to $J = 7 \leftarrow 6$) and higher vibrational excited states using frequency-magnetic field double modulation technique. An extensive analysis was performed, in particular, for higher bending vibrational states. We will discuss implication of our observation to the branching ratio of the dissociative recombination reaction of $HCNH^+$.

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[b] T. Amano, paper RD05, 53rd International Symposium on Molecular Spectroscopy, Columbus, Ohio, USA, June, 1998

[c] T. Okabayashi and M. Tanimoto, J. Chem. Phys. **99**, 3268-3271(1993)