THE DISSOCIATIVE RECOMBINATION OF CH_3O^+ AND CD_3O^+ CATIONS

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Reactions with the methoxy radical CH_3O^+ have found to be significant pathways of production and destruction of important interstellar molecules and ions like NH_4^+, NH_3, H_2O, H_3O^+ [a]. These processes compete with the dissociative recombination of the named ions. Therefore, measurements of the rates, cross-sections and branching ratios of the dissociative recombination of the iosotopomers CH_3O^+ and CD_3O^+ have been perfomed at the CRYRING storage ring located at Stockholm, Sweden.

Preliminary evaluation of the data yielded a reaction rate coefficient of $6.8*10^{-7}\left(\frac{T}{300}\right)^{-0.63}$ cm^{3}mol^{-1}s^{-1} and $8.4*10^{-7}\left(\frac{T}{300}\right)^{-0.62}$ cm^{3}mol^{-1}s^{-1} for CH_3O^+ and CD_3O^+, respectively. Calculation of the branching ratios rendered the following branching ratios for the reaction channels leading to the fissure of the C-O bond:, H_2O+CH (0.7%), CH_2+OH (1.6%); D_2O+CD (2%), CD_2+OD (6%) respectively. The rest of the dissociative recombination rates was contributed from channels leaving the C-O bond intact: 92% and 98% for CH_3O^+ and CD_3O^+, respectively. Contrary to the $CH_3OH_2^+$ ion[b], the pathways preserving the bond between the heavy atoms dominate.

[a] S.A. Haider, Anil Bhardwaj, ICARUS, 177, 196.

[b] Geppert, W. D. Semaniak, J., Hellberg, F, Österdahl, F., Roberts, H., Millar, T. J, Hamberg, M., Thomas, R. D., af Ugglas, M., Ehlerding, A., Zhaunerchyk, V., Kaminska, M., Larsson, M., Faraday Discussions, 133, 2006, accepted for publication.