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THRESHOLD PHOTOELECTRON SPECTRA OF TETRAHYDROFURAN AND A-TETRAHYDROFURFURYL ALCOHOL OVER THE ENERGY RANGE 9 eV TO 30 eV

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Tetrahydrofuran (THF), C_4H_8O and α-tetrahydrofurfuryl alcohol (THFA), $C_5H_{10}O_2$ molecules are considered to be the simplest model analogues of deoxyribose, the subunit of the DNA sugar backbone, for investigations of its interactions with ionizing radiation. Although, there have been recently a number of electron impact studies of these molecules (*e.g.* [1-3]), relatively little is known about their interactions with ultraviolet radiation [4, 5]. In this communication we present results of threshold photoionization measurements of THF and THFA with the use of monochromatic synchrotron radiation. The operation of the threshold photoelectron spectrometer used for these experiments is based on the penetrating field technique [6]. In the measurements it was tuned to detect photoelectrons with energies of less than 5 meV. The spectra for single photoionization were recorded in the photon energy range 9-30 eV, with an energy resolution of 10 meV which allowed the vibrational structures in THF to be resolved for the first time.

Fig. 1 shows the threshold photoelectron spectra of THF and THFA obtained in the energy regions above the first ionization thresholds. From a comparison of both spectra the effect of substitution of the α-H atom by the CH_2OH group is clearly seen. Well resolved oscillatory structure superimposed on the 9.7 eV band in THF is not present in the THFA spectrum. This could be a result of damping of the ring vibrations by attachment of the alcohol group. Also, the second band of THFA (10.5 eV) is absent in the THF spectrum. It thus can be assigned to ionization from the hydroxyl oxygen.

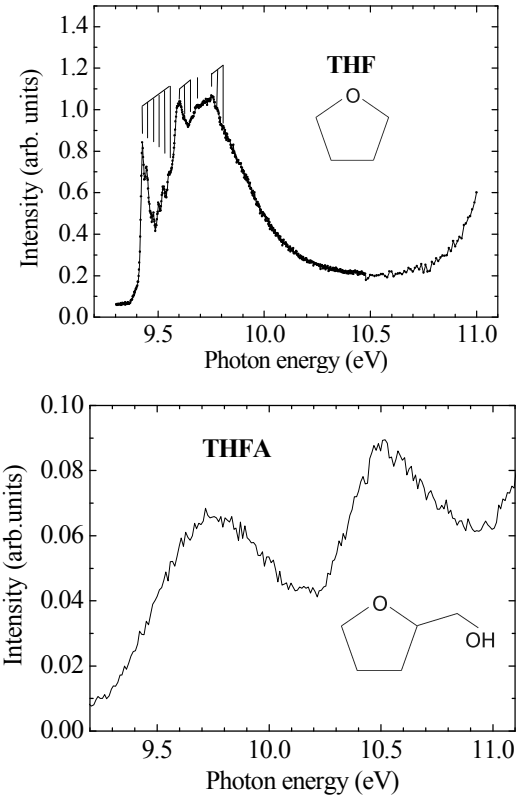

Figure 1. Threshold photoelectron spectra of THF and THFA

References

[1] M. Dampc, A.R. Milosavljevic, I. Linert, B.P. Marinkovic, M. Zubek, "Differential cross sections for low-energy elastic electron scattering from tetrahydrofuran in the angular range 20°-180°", *Phys. Rev. A* **75** (2007) 042710.

[2] M. Allan, "Absolute angle-differential elastic and vibrational excitation cross sections for electron collisions with tetrahydrofuran", *J. Phys. B: At. Mol. Opt. Phys.* **40** (2007) 3531.

[3] P. Sulzer, S. Ptasinska, F. Zappa, B. Mielewska, A.R. Milosavljevic, P. Scheier, T.D. Märk, I. Bald, S. Gohlke, M.A. Huels, E. Illenberger, "Dissociative electron attachment to furan, tetrahydrofuran, and fructose", *J. Chem. Phys*. **125** (2006) 044304.

[4] *Handbook of HeI Photoelectron Spectra,* K. Kimura (Eds.) (Halsted Press, New York, 1981).

[5] B.C. Ibanescu, O. May, A. Monney, M. Allan, "Electron-induced chemistry of alcohols", *Phys. Chem. Chem. Phys.* **9** (2007) 3163.

[6] R.I. Hall, A. McConkey, K. Ellis, G. Dawber, L. Avaldi, M.A. MacDonald, G.C. King, "A penetrating field electron-ion coincidence spectrometer for use in photoionization studies", *Meas. Sci. Technol.* **3** (1992) 316.