

**THE VACUUM -UV PHOTOABSORPTION SPECTROSCOPY  
OF THE THREE-MEMBERED RING SYSTEMS  $C_3H_6$ ,  $C_2H_4O$  and  $C_2H_4S$   
AND THEIR OPEN CHAIN ISOMERS.**

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During several years we investigated the vacuum UV photoabsorption, the He(I)- and threshold photoelectron spectra and the photoionization mass spectrometry of many halogenated derivatives of methane [1] and ethylene [2-4]. A very large amount of data has been obtained and their publication are in progress. These data were completed by laboratory work performed in Liège on the translational energy distribution measurements of most of the fragment ions appearing in the mass spectra recorded with He(I), Ne(I) and Ar(II) resonance lines.

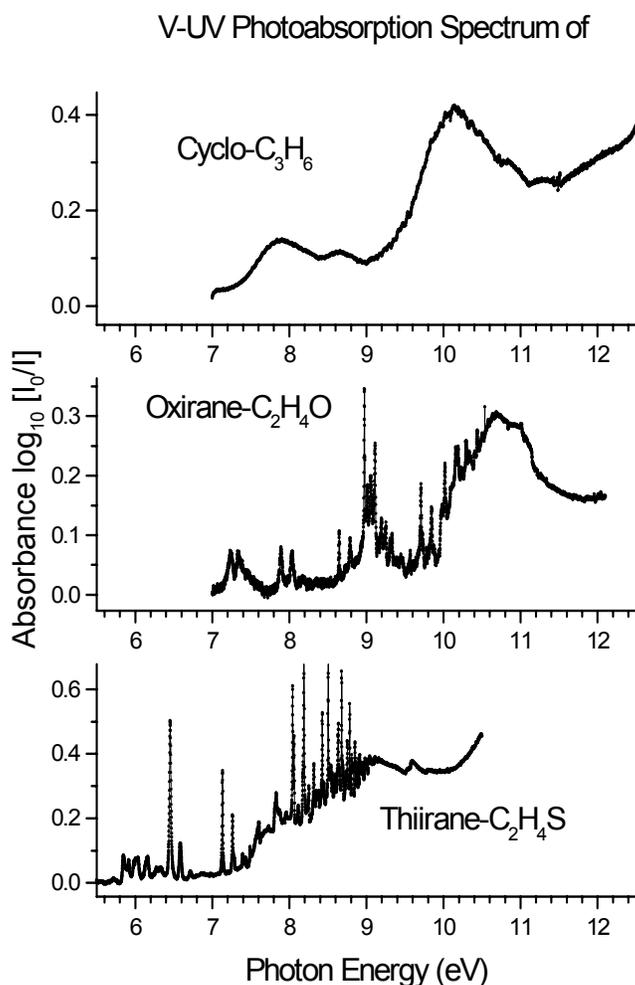


Fig. 1: Vacuum UV absorption spectra of cyclopropane, oxirane and thiirane.

Another class of interesting small molecular systems are the three-membered rings:  $C_3H_6$  or cyclopropane,  $C_2H_4O$  or oxirane,  $C_2H_4S$  or thiirane and  $C_2H_5N$  or aziridine. Spectroscopic data related to these systems are very scarce in the literature. No high level quantum mechanical calculations are available. When stable, the open structured isomers are also worth being reinvestigated at higher resolution.

These are a few reasons of a thorough investigation of the photoabsorption and mass spectrometric photoionization of these compounds. The data obtained at BESSY II were completed by laboratory experiments of He(I)-, Ne(I)- and Ar(II)-resonance line photoelectron and photoion kinetic energy spectroscopy of the fragments.

A 3m-NIM monochromator (on the 3m-NIM-2

beamline) was used, equipped with a 600  $\ell$ /mm Al-grating. A major disadvantage of this material, however, is its reflectivity gap between 16-18 eV. Entrance and exits slits were adjusted at 10-30  $\mu$ m allowing a resolution of about 5 000. The photon energy was scanned between 5-25 eV.

Fig.1 shows typical examples of photoabsorption spectra recorded between 5.5-12.5 eV for cyclopropane, oxirane and thiirane respectively. The high toxicity of aziridine prevent to introduce it in the experimental hall.

Excepting that of cyclopropane, the spectrum of the two other compounds show very sharp and strong features corresponding to Rydberg transitions accompanied by well resolved vibrational fine structure. A close examination of the broad absorption band peaking at about 10.12 eV in cyclopropane reveals also a vibrational progression. The detailed examination and interpretation of the experimental results and the assignment of all these features are in progress.

The photoabsorption spectra have been measured under the same conditions for the stable open chain isomers of  $C_3H_6$  and  $C_2H_4O$ , i.e. propene and acetaldehyde.

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