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THE PHOTOIONIZATION OF ETHYLENE MONOBROMIDE (C_2H_3Br). THE THRESHOLD PHOTOELECTRON AND CIS SPECTROSCOPY.

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In our project related to the investigation of the halogenated ethylenes, we already reported on the spectroscopy of monofluoroethylene (vinylfluoride), 1,1-difluoroetylene (vinylidene fluoride) [1], monochloroethylene (vinylchloride) [2,3] and on the 1,1- and 1,2-dichloroethylene isomers [4]. In these reports the photoabsorption spectrum, the threshold photoelectron spectrum and the Constant Ion State spectra (CIS) were reported briefly.

In the present contribution we will present the first results on the investigation of the photoionization of the monobromoroethylene (C_2H_3Br) molecule. With the threshold photoelectron spectrum and the CIS-spectra, results on the photoabsorption spectrum, recorded previously, will also be reported. These data proved to be essential for the interpretation of the threshold photoelectron spectra and the CIS-spectra [2,3]. The present photoabsorption work was performed on the 1.5m-NIM-l beamline, whereas the photoelectron spectra were investigated by using the 3m-NIM-l beamline at the synchrotron radiation facility BESSY. The light is dispersed on a 1 200 ℓ/mm and 2 400 ℓ/mm gratings respectively. In the photoelectron spectroscopic work, a tandem electron spectrometer consisting of two 180° electrostatic analyzers has been used.

The VUV-photoabsorption spectrum, of C_2H_3Br and between 5-20 eV photon energy, is displayed in fig. 1. This spectrum could be analyzed in terms of Rydberg transitions superimposed on an underlying, smoothly varying continuum ascribed to valence to virtual valence transitions of the type n or π to σ^* or π^*. Owing to the better resolution achieved in this work, the Rydberg transitions have been reanalyzed. Not only the 0-0 transitions but also the extended vibrational structure of the series have been analyzed. Rydberg series converging to the first two ionization limits at 9.874 eV and 10.924 eV successively, give rise to the structure observed in the 5-10.5 eV region.

Extended vibrational fine structure has been identified and assigned. At higher energies, the absorption spectrum exhibits broad bands accounted for by Rydberg series converging to higher lying ionization limits, e.g. 15.930 eV and 16.110 eV.

The threshold photoelectron spectrum (fig.2) and the vibrationally resolved CIS spectra (fig.3) show abundant structure which have to be related to autoionization of Rydberg states observed and identified in the absorption spectrum. Analyses and assignments are in progress.

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Fig. 1 *: The photoabsorption spectrum of monobromooroethylene between 6-20 eV photon energy.*

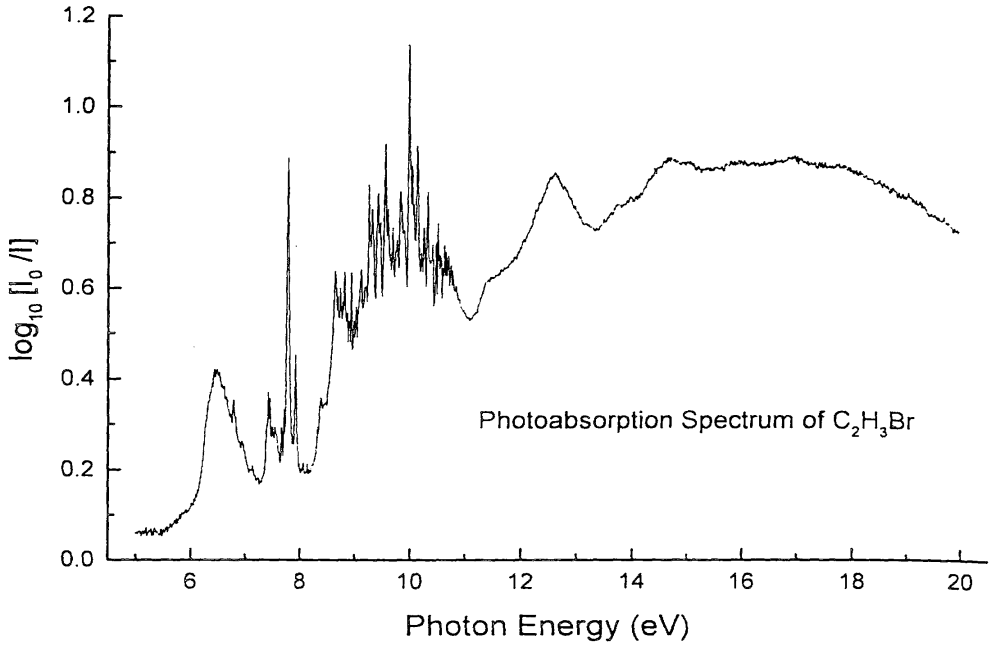

Fig. 2*: The threshold photoelectron spectrum of monobromoethylene between 9-25 eV photon energy*

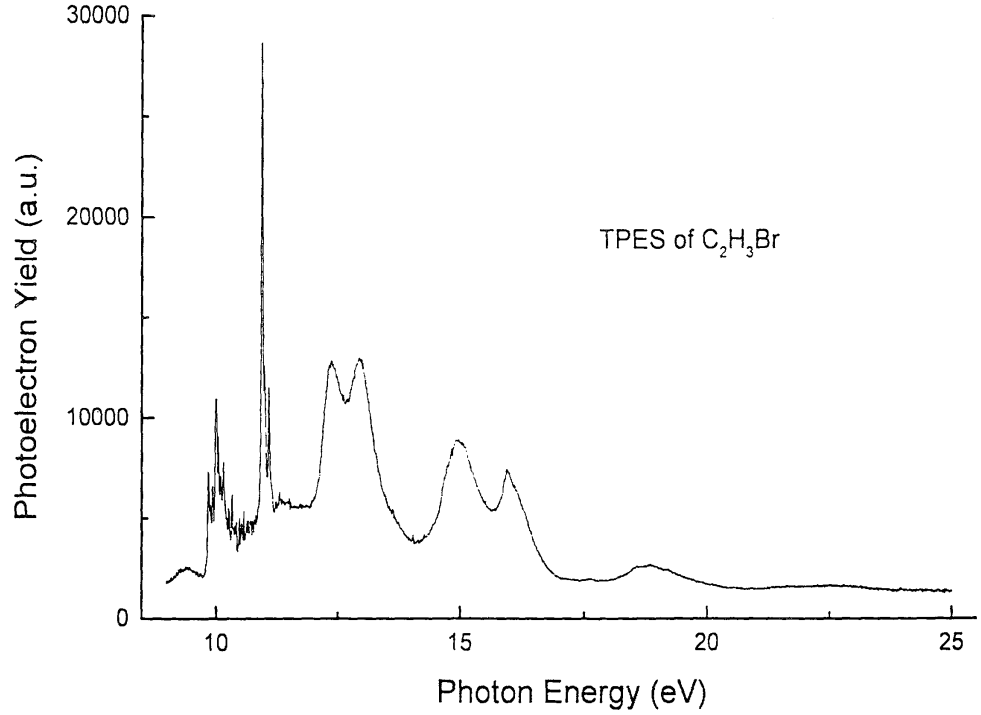

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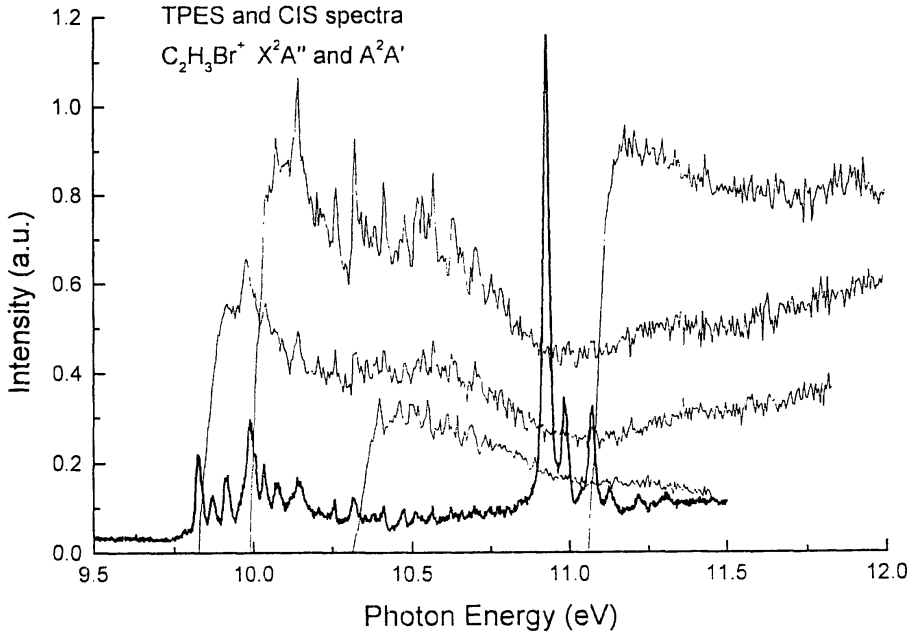
***Fig. 3**: The threshold photoelectron spectrum of the X^2A'' and $A^2\ A'$ of monobromoethylene between 9-12 eV photon energy including vibrationally resolved CIS spectra for a few levels.*



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