

THE PHOTOIONISATION OF SMALL VINYL BROMIDE (C₂H₃Br)_n CLUSTERS.

A. Hoxha, B. Leyh¹, R. Locht,

Département de Chimie Générale et de Chimie Physique, Université de Liège, Institut de Chimie, Bât B6, Sart-Tilman par B-4000 Liège 1, Belgium.

M. Malow, K. M. Weitzel and H. Baumgärtel

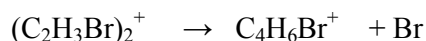
Institut für Physikalische und Theoretische Chemie, Freie Universität Berlin, Takustrasse 3, 14195 Berlin, Germany.

In our earlier work on vinyl bromide ions we have studied in detail the spectroscopy and dynamics of dissociation of the isolated ions. We have already reported the photoabsorption spectrum, the threshold photoelectron spectrum and the Constant Ion State spectra (CIS) [1] as well as the TPEPICO-TOF study of the C₂H₃Br⁺ monomers [2]. In the present contribution we will focus on the first results obtained on the study of vinyl bromide clusters. The study of reactive processes in cluster ions is believed to offer a bridge between isolated ion and solvated ion reactivity.

The clusters were prepared in a molecular beam seeded in He or in Ar. Typically 3 to 5 bars of C₂H₃Br mixed with He or Ar were expanded through a 70 μm diameter nozzle at room temperature. The clusters were analysed using a TPEPICO-TOF technique. A pure molecular beam of C₂H₃Br gave no clusters. It has been observed that clustering is favoured by high dilution i.e. by mixing ratios of 1:30 C₂H₃Br:Ar. No mixed clusters were observed under these conditions. The intensity of homogeneous Ar clusters is reduced compared to a pure Ar beam.

The TOF spectrum given in figure 1 clearly shows the presence of dimers and trimers ions. No higher mass clusters were observed, probably because the nozzle was not cooled. Besides dimers and trimers, reaction products are found at m/z=131-133-135 which correspond to the C₄H₆Br⁺ and C₄H₆Br⁺ ions.

These fragments can formally be described as coming from the dissociation of the dimers. However this relation is only formal because the actual parent ion is not known.

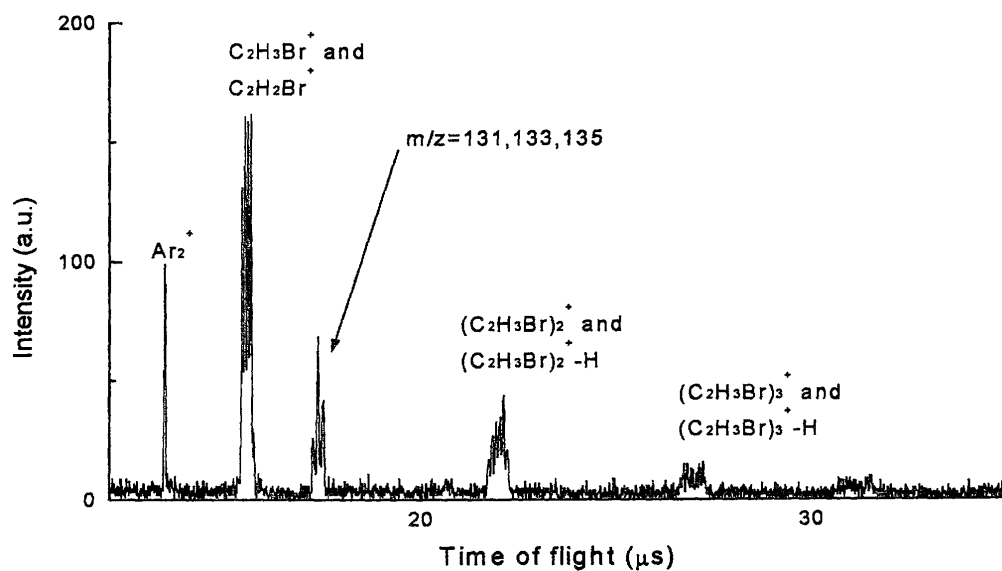


A first determination of the appearance potential of the dimer ion leads to a value of 9.7 eV. This value is only 0.1 eV lower than the ionisation energy of the monomer (9.8 eV). However this value corresponds to the vertical ionisation energy. The adiabatic production of dimer ions from neutral dimers is generally characterised by small Frank-Condon factors. Thus the 0.1 eV represents only a lower limit of the binding energy of the ionic dimers.

¹ Chercheur qualifié du FNRS (Belgium)

A further study of the clusters is expected to uncover more details of the intracuster reaction dynamics.

Fig. 1: The TPEPICO-TOF spectrum of C_2H_3Br in He at 15eV photon energy



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References

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- [2]. A. Hoxha, B. Leyh, R. Locht, M. Malow, K. M. Weitzel and H. Baumgartel, BESSY Jahresber.(1999) 000.