HIGH RESOLUTION PHOTOABSORPTION SPECTROSCOPY OF THE METHYL HALIDES. TESTS AND FIRST RESULTS.

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The most recent investigations of the photoabsorption and photoionization of the methyl halides (CH_3X with X= F, Cl, Br and I) were performed on a 1.5m-NIM monochromator at the BESSY I facility [1] . The results on CH_3F and CH_3Cl (CD_3Cl) have been published fairly recently [2-5]. Even though the analysis of the Rydberg series observed in CH_3Br (CD_3Br) and CH_3I (CD_3I) is fairly obvious, several new assignments should be proposed. A deeper fine structure analysis prescribed a monochromator characterized with a higher resolution.

The main aim of the measurements reported in this contribution is the search and test of an instrument allowing us to achieve this goal. At the BESSY II facility the most suitable instrument is a 3m-NIM monochromator and is presently available for this purpose (the 3m-NIM-2 beamline). Transferred from BESSY I, its reassembling and commissioning at BESSY II have been achieved very recently [6].

It is equipped with a 600 l/mm (Al/MgF_2 coated) and a 2 400 l/mm (Pt coated) grating. Only the latter has been used. Slit widths of 50μm were used and an MgF_2 window is available for second order suppression. A photoabsorption cell of 30 cm optical pathlength is mounted on the monochromator together with a two stages differential pumping system to obtain the allowed working pressure in the monochromator. The standard procedure to obtain the absorbance $\log_{10}(I_0/I)$ was to scan successively the absorption spectrum and the transmission spectrum of the monochromator. In the present contribution we present the first results on the investigation of the photoabsorption of the methyl bromide (CH_3Br) and iodide (CH_3I). The corresponding perdeuterated isotopomers as well as CH_2DI have also been investigated. Most of the spectra have been recorded in the 5-25 eV photon energy range.

Above the 10 eV photon energy range the VUV photoabsorption spectrum of CH_3I shows only a few broad bands, whereas below this energy narrow atomic-like structures are observed [1]. A congested fine structure is observed in the 9.3-10.0 eV

photon energy range [1] and is shown in fig.1. As expected, it is obvious from this picture that an

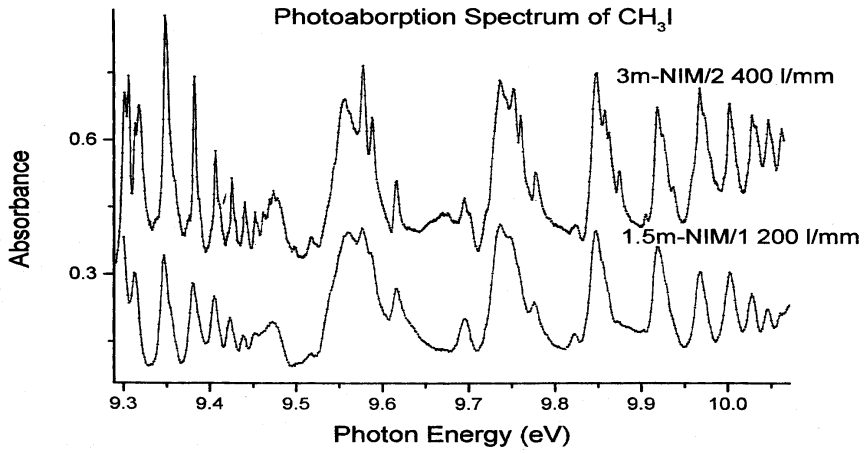

Fig.1 The absorption spectrum of CH_3I as recorded between 9-10 eV.

important increase of resolution is obtained with the present monochromator. However, problems remain and have to be solved in the future, particularly in the low photon energy range (5-10 eV) where photon beam instabilities are noticable in the transmission curve. These are probably related to both mechanical and optical insufficiencies from the monochromator and the focussing mirrors.

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