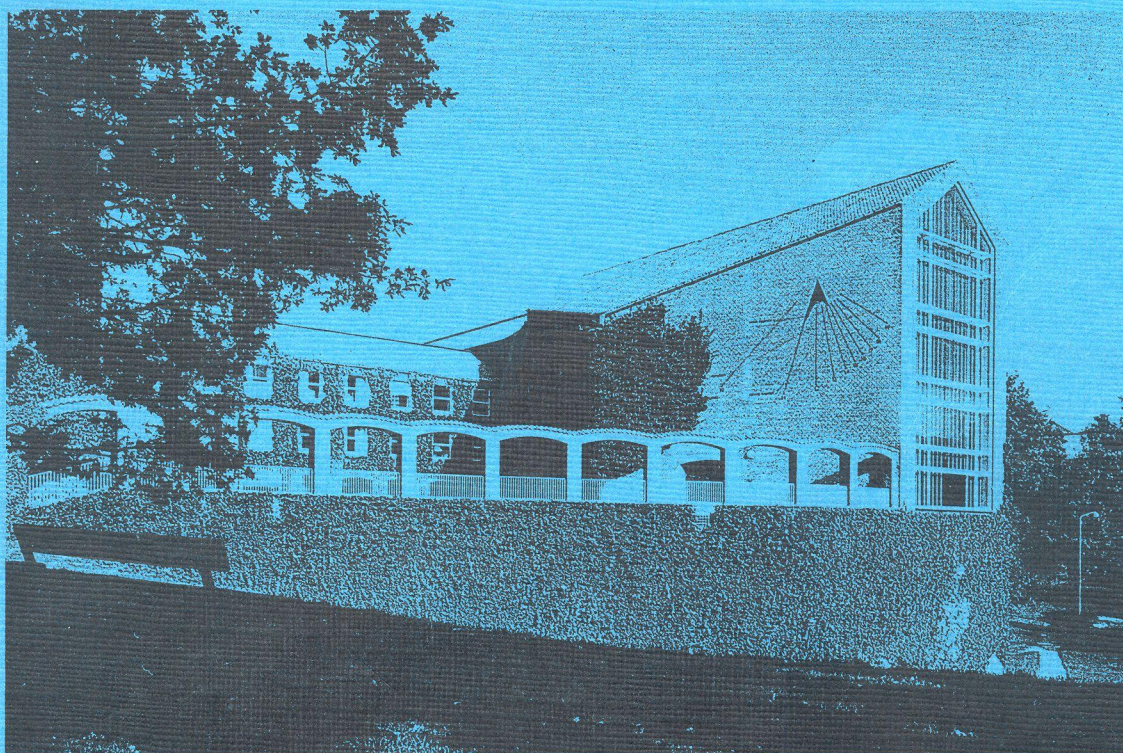




ABSTRACTS OF
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DIFFERENTIAL CROSS SECTIONS FOR ELECTRON EXCITATION OF CADMIUM
AUTOIONIZING $(5p)^3P_1$ AND $(5p)^1P_1$ LEVELS

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Relative differential cross sections (DCS) for electron excitation of cadmium autoionizing $(5p)^3P_1$ and $(5p)^1P_1$ levels have been obtained at 40 eV impact energy and from 2° to 150° scattering angles. This is an extension of our previous work on electron scattering by cadmium atom¹. DCS are put on absolute scale by normalization to the measured optical oscillator strengths (OOS)².

A crossed electron - atom beam technique has been used in the electron spectrometer operating in energy loss mode. Overall energy resolution was 50 meV while the angular resolution of the spectrometer was estimated to be $1^\circ - 2^\circ$. Primary beam current was 1-10 nA. An electron detector collects scattered electrons at a particular scattering angle with respect to the incoming electron beam over a solid angle 10^{-3} sr.

For two fixed energy losses of 12.065 and 12.610 eV angular distributions of scattered electrons were recorded. After subtracting the background arising from the ionisation continuum & applying effective pathlength correction factors relative DCS were obtained.

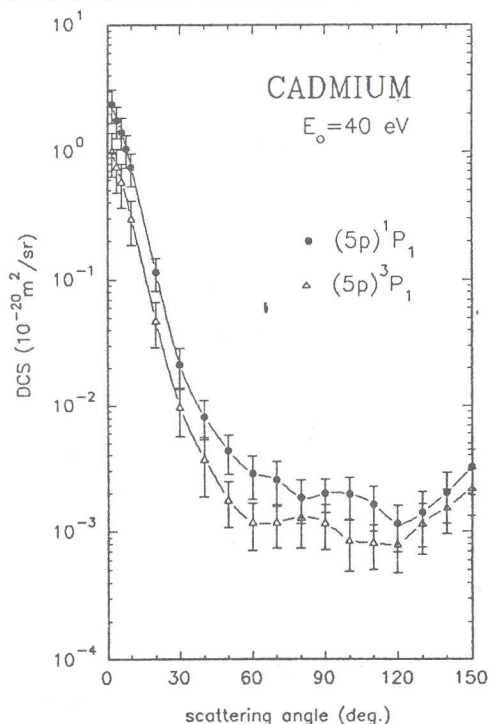


Figure 1. Differential cross sections

Differential cross sections for the $(5p)^1P_1$ state were converted to the generalized oscillator strengths (GOS) and normalized to the optical value of 0.53. The measured ratio of the $(5p)^1P_1$ and $(5p)^3P_1$ is 2.51 ± 0.50 (statistical error) at 10° . From this ratio absolute DCS for the $(5p)^3P_1$ state was obtained. If GOS is extrapolated to zero squared momentum transfer, obtained GOS is 0.073 what is in accordance with the reported² value of 0.07. Differential cross sections and absolute errors are presented in figure 1.

Statistical error at each scattering angle is obtained as a weighted mean of several independent measurements. Estimated errors due to the uncertainty of energy scale is 0.5%, due to the uncertainty of angular scale 10%, due to applied pathlength correction factor 5% and due to the uncertainty of fitting and extrapolating on GOS 17%. The error due to the uncertainty of intensity ratio is 25% and due to the uncertainty of GOS used in normalization procedure is 20%. Overall absolute errors presented in figure 1 are obtained as a square root of the sum of squared errors including statistical error for each scattering angle.

Integrated cross sections (integral, momentum transfer and viscosity cross sections) are obtained by extrapolating DCS to 0° and 180° scattering angles and integrating over solid angle. Extrapolation to 0° is made by using the fitting curve for GOS for the $(5p)^1P_1$ state. Obtained integral cross sections are 0.277 ± 0.081 and $0.117 \pm 0.045 \times 10^{-20} \text{ m}^2$ for the $(5p)^1P_1$ and $(5p)^3P_1$ states, respectively.

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