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DIFFERENTIAL CROSS SECTIONS OF 200 AND 300 eV
ENERGY ELECTRONS ELASTICALLY SCATTERED BY KRYPTON ATOMS

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. We extended our measurements of electron scattering to krypton atom as a target in order to obtain absolute differential cross section values. Differential cross section data for the krypton atom have not be published so far, and only relative intensity curves existed for a few energies (1)(2). At the time we finished these measurements Bromberg (3) sent us a preprint including absolute differential cross sections of elastically scattered electrons by krypton atom, too.

The apparatus these measurements have been done with has been reported elsewhere (4). Briefly the experiment can be described as follows. An electron gun shoots the electron beam with energy width of 1 eV into a gasous target. The current of the primary beam I_o is measured by a Faraday cup. Scattered electrons are energy selected by a retarding field analyser ' and their current I_s measured by collection in a Faraday cup, too. The electron gun and the scattered beam collector were mounted in separately pumped vacuum chambers.

In our earlier measurements the gas target pressure was determined using an IGM2A (Edwards) type ionization gauge calibrated by Leck (5) for various gases. This part of the experiment was altered recently in the following way. The gas pressure is monitored and measured by an IEVT ionization gauge. The same gauge was, after completing the differential cross section measurement, transfered to an other vacuum system and absolutely calibrated by a gas flow method (6)(7). The calibration method was carefully examined and all possible errors determined (8).

From measured quantities of primary beam current I_o, scattered electron current I_s and gas pressure p the differential cross section was calculated using equation

$$\sigma(\theta_o) = \frac{I_s}{I_o\,p} \frac{\sin\theta_o}{(L_{90}\cdot\Delta\Omega_{90})} \quad A$$

Here L_{90} is the effective primary beam length as seen from the
scattered electron detector second aperture, and $\Delta\Omega_{90}$ is the
solid angle of the detector aperture in respect to the scatte-
ring center, both for angle $\theta_o = 90°$. For angles different
than $90°$ the product of these two geometrical quantities was
corrected by the sin approximation. For dimensions of our
apparatus the real width of the beam could be neglected, and
the beam taken to be linear.

For absolute cross section determinations one has to have
scattered electron sygnals measurable to high accuracy by
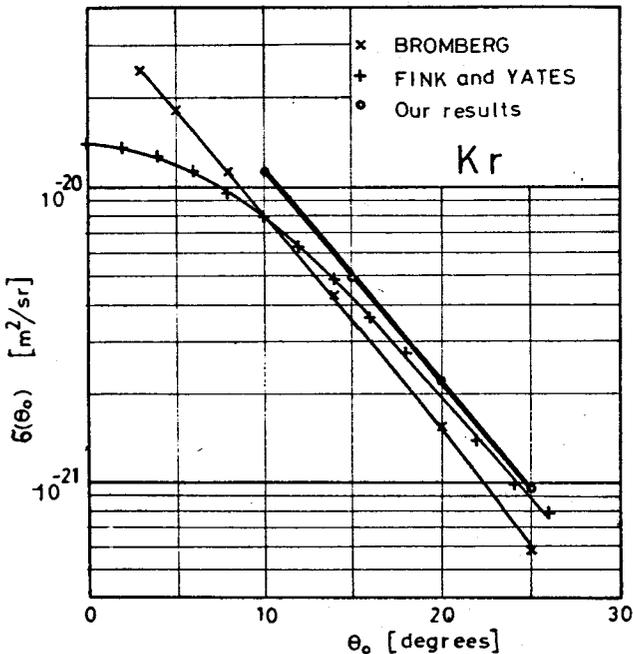using the available instruments. That is why cross section

Fig. 1. - Differential cross sections for elastic scattering
of 200 eV electrons by the krypton atom

determinations were performed in a narrow angular interval from 10 - 25°, where the scattered electron sygnal is of the order of 10^{-13} - 10^{-12} ampers. For bigger angles the scattered sygnal becomes to low, interfering with the background sygnal, so that its measurement with integral methods is rather difficult. For angles bigger than 25° the sygnal will be determined by single electron detection and then normalized to cross section values at smaller angles. Results of these experiments will be reported in due coarse.

Preliminary results for incident electron energies of 200 and 300 eV are presented in Fig. 1 and 2, respectively. For comparison data of Bromberg (3) are shown, as well as calculations by Fink and Yates (8).
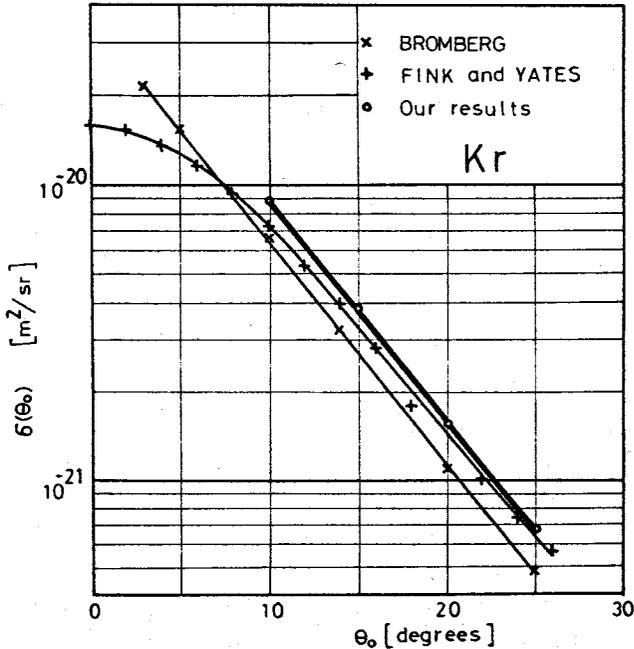

Fig. 2.- Differential cross sections for elastic scattering of 300 eV electrons by the krypton atom

As one can see our results are higher that those of Bromberg for both measured energies. It is important to point out that the shape of curves are identical in measurements of Bromberg and ours, and that the ratio of cross section values for all measured angles is almost constant.

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