

XXI ICPEAC

**TWENTY FIRST INTERNATIONAL CONFERENCE
ON THE PHYSICS OF ELECTRONIC AND ATOMIC
COLLISIONS**

**SENDAI, JAPAN
22-27 JULY 1999**

ABSTRACTS OF CONTRIBUTED PAPERS

VOLUME I

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DIFFERENTIAL CROSS SECTIONS FOR ELECTRON ELASTIC SCATTERING BY ZINC ATOM

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Normalized experimental elastic differential cross sections (DCS) for the electrons scattered by zinc atom are presented. Incident energies were 25 and 40 eV and scattering angles ranged from 20 to 150°.

As a continuation of our previous work on differential cross section (DCS) measurements for the electron impact on cadmium¹ and mercury² atom, here we present a part of our work on zinc. To our knowledge, there are no recent experimental data of differential cross sections for either elastic or inelastic electron scattering on Zn except those given by Williams and Boziniš³ (1975) at 40 eV incident electron energy. On the other hand, there are only two recent theoretical papers concerning electron - Zn atom scattering: the first by McGarrah *et al*⁴ (1991) who calculated elastic differential and total cross sections, from 12.5 to 200 eV, using the optical model which takes into account static, polarization and exchange potential; and second by Kaur *et al*⁵ (1997), who calculated DCSs, Sherman functions and Stokes parameters for three incident electron energies (10, 20 and 40 eV) for the 4^1P and $4^3P_{0,1,2}$ states, in the relativistic distorted-wave approximation scheme.

The experiment we performed is of the crossed-beam type and it has been described elsewhere^{1,2}. To produce zinc vapour beam, we have constructed a new oven⁶ in order to attain higher ultimate temperatures and a better temperature control. The overall energy resolution of about 150 meV has been enough to resolve all excited states (below the ionization limit) which corresponded to most prominent peaks in the energy loss spectrum and to give sufficiently big count rates for both elastic and inelastic cross sections at big angles. At 40 eV, according to Williams and Boziniš³, elastic electron - Zn atom scattering DCSs are of the order of 10^{-22} m²/sr at $\theta = 40^\circ$ and even smaller (10^{-24} m²/sr) at large scattering angles. This makes the measurements very difficult.

We have measured differential cross sections for electrons at 25 and 40 eV incident electron energies, scattering angles ranging from 20 to 150°. We have normalized our measurements at 25 eV on theoretical data of McGarrah *et al*⁴ at 70° which appeared as a local maximum of the DCS curve (Figure 1). One can notice general agreement in shape, but also a certain disagreement in the position and depths of the two local minima. For the final comparison we need to calculate the absolute DCS and for that purpose we employ the zero-angle generalized oscillator strength normalization to the value of optical oscillator strength for the resonant 4^1P state.

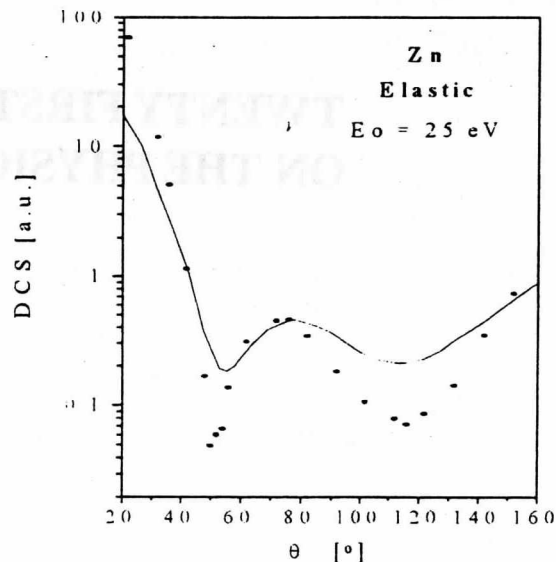


Figure 1: Elastic DCS for electron scattering on zinc atom, at 25 eV: present, theoretical calculation of McGarrah *et al*⁵

Research has been done under the MST project 01E02 of Republic of Serbia

References:

1. B. Marinković, V. Pejčev, D. Filipović and L. Vušković, *J.Phys.B:At.Mol.Opt.Phys.* **24** (1991) 1817
2. R. Panajotović, V. Pejčev, M. Konstantinović, D. Filipović, V. Bočvarski and B. Marinković, *J.Phys.B: At.Mol.Opt.Phys.* **26** (1993) 1005
3. W. Williams and D. Boziniš, *Phys.Rev.A* **12** (1975) 57
4. D.B. McGarrah, A.J. Antolak and W. Williamson Jr., *J.Appl.Phys.* **69**(10) (1991) 6812
5. S. Kaur, R. Srivastava, R.P. McEachran and A.D. Stauffer *J.Phys.B:At.Mol.Opt.Phys.* **30**(1991) 1027
6. R. Panajotović, V. Pejčev, Z.D. Pešić and B. Marinković, VI ECAMP, Siena, Italy, Contributed Papers (1998) 114

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