19th Summer School and International
Symposium on the Physics of Ionized Gases

19th SPIG

August 31 - September 4, 1998, Zlatibor, Yugoslavia

CONTRIBUTED PAPERS

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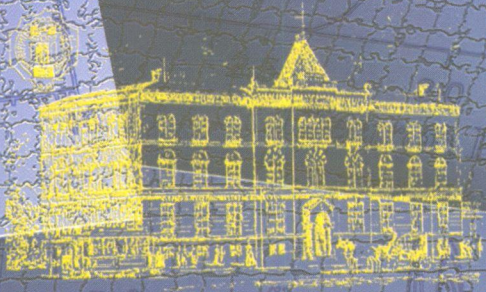
ABSTRACTS OF INVITED LECTURES, TOPICAL INVITED LECTURES AND PROGRESS REPORTS



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Publisher:
Faculty of Physics
University of Belgrade
Studentski trg 12-16, 11000 Belgrade, Yugoslavia

Front cover design:
N. Šišović and I. Videnović

Printed by:
Public Enterprise of PTT Traffic "Srbija"
Publishing Department
Belgrade, Yugoslavia

Impressio: 400 copies

PREFACE

This book contains the Contributed papers and abstracts of the Invited lectures, Topical invited lectures and Progress reports to be presented at the 19th Summer School and International Symposium on the Physics of Ionized Gases - SPIG '98. The Symposium will be held in Zlatibor, Yugoslavia, from August 31 to September 4, 1998.

In accordance with the scientific scope of the Symposium, the Contributed papers are related to the following research fields: Atomic Collision Processes, Particle and Laser Beam Interaction with Solids, Low Temperature Plasmas and General Plasmas. The length of a Contributed paper is limited to a maximum of four pages, each of them presenting an original work with sufficient amount of scientific information.

The Scientific and Organizing Committees believe that this Symposium, with its Invited talks and Contributed papers, managed to maintain the high scientific level established by preceding SPIG conferences in the 38 years long tradition.

The Editors are indebted to the members of the Scientific Committee for their efforts in formulation of the program, especially in proposing the speakers and in the selection of papers included in this book.

The Organizer of the 19th SPIG is the Faculty of Physics, University of Belgrade. The Organizing Committee is grateful to the staff of the Faculty for their help in preparation of this Symposium. The Organizer gratefully acknowledges the support of the Ministry of Science and Technology of the Republic of Serbia and Ministry of the Development, Science and Environment of the Federal Republic of Yugoslavia.

Special gratitude is due to N. Šišović and M. Savić whose enthusiastic assistance and hard work made this book available.

The participants have been asked to send their papers camera ready, so no typing, spelling and grammatical errors have been corrected in the course of preparation of this book.

July, 1998

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ELECTRON INTERACTIONS WITH ZINC ATOM

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Electron scattering by atoms of the IIb group of the Periodic System of Elements has been the main subject of our interest. We measured differential cross sections (DCSs) for electron impact on cadmium atom [1] and mercury atom [2], whereas now we work on the zinc atom, which happen to be the least investigated.

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 Bozinis (1978) [4] who measured DCSs for the elastic scattering and for the excitation of four states, at 40eV 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* (1991) [5] who calculated elastic differential and total cross sections, from 12.5 to 200 eV, and second by Kaur *et al* (1997) [6], who calculated DCSs, Sherman functions and Stokes parameters for three incident electron energies (10, 20 and 40 eV) for the first four excited states.

Our experiment is of the crossed-beam type and it has been described elsewhere [1,2]. For this particular purpose we have constructed a new oven in order to attain higher ultimate temperatures and a better temperature control. The crucible is made of titanium [3] which is completely resistive to zinc vapor. It is placed into the stainless steel cylinder which bears two heaters - one at the top and the other at the lower half, thus providing the temperature difference of about 100 ^{o}C. We used a titanium foil to make a reflective shield around the oven and the tantalum foil at its top end. Temperature monitoring was carried out by two thermocouples, at the bottom and at the top of the crucible. In order to estimate the overall energy resolution and to make sure that there are no multiple collisions in the interaction region, we took down the energy-loss (ΔE) spectrum. In Figure1 are shown the energy-loss spectra for the E_o= 40 eV incident electrons, scattered at θ= -6^{o}, 10^{o} and 20^{o}. The working pressure was of the order of 10^{-4} Pa and the oven temperature (at the bottom) 380^{o}C. Since the states of zinc are well separated, it was not necessary to insist on obtaining the best possible energy resolution. In the case of these spectra, it was about 150 meV.

Our aim is to measure differential cross sections for electrons of different incident energies, from 20 to 100 eV, scattered at angles ranging from 20 to 150^{o}. It is obvious from Figure 1 that the most dominant process at small angles is the excitation of the 4^1P state of Zn. The other states have much less probability for excitation. It is the same with elastic scattering. According to Williams and Bozinis [4], electron - Zn atom scattering DCSs are of the order of 10^{-22} m^2/sr at θ = 40^{o} and even smaller (10^{-24} m^2/sr) at bigger scattering angles. This makes the measurements very difficult.

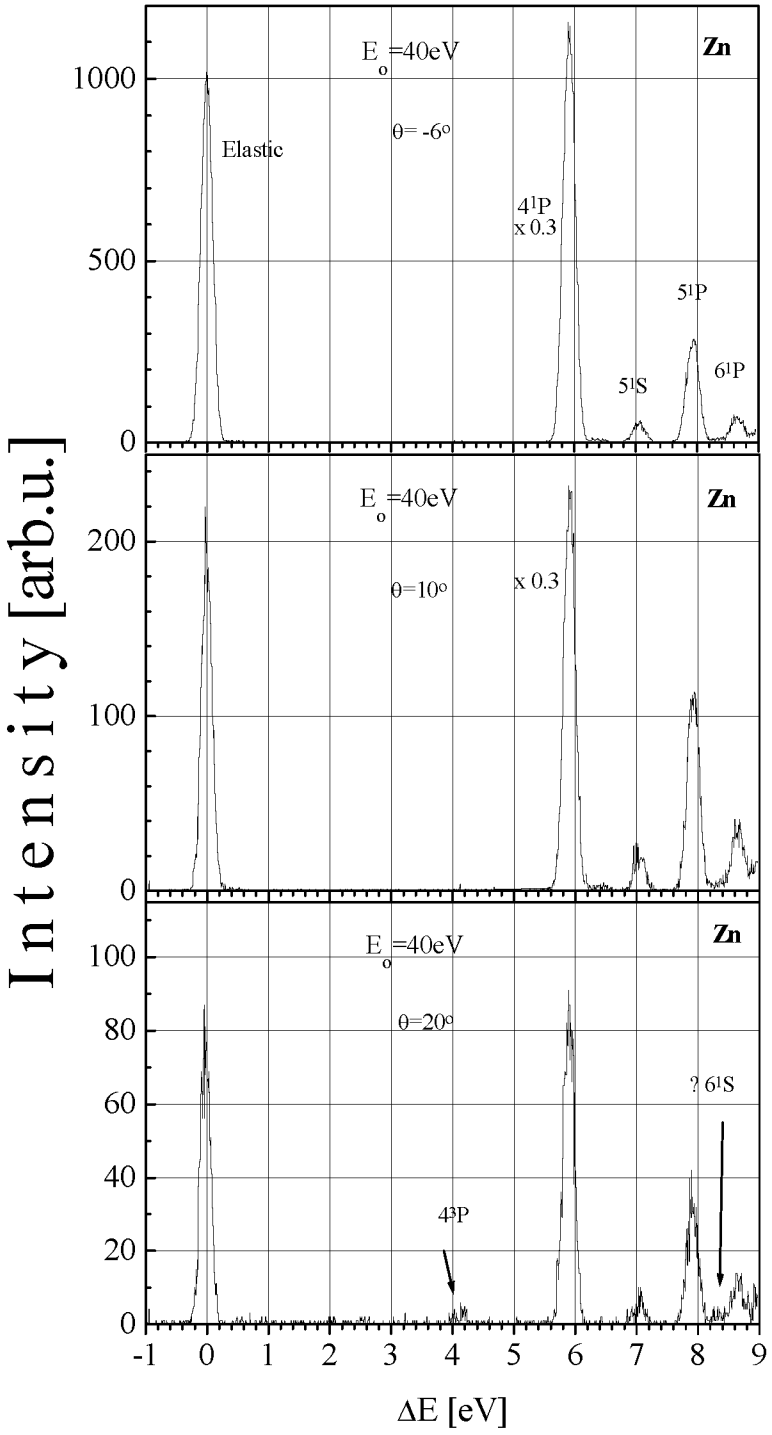

Figure 1: Energy-loss spectrum for electron-Zn atom scattering

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