

SERBIAN ACADEMY OF SCIENCES AND ARTS

SCIENTIFIC MEETINGS

Volume XCVIII

DEPARTMENT OF MATHEMATICS, PHYSICS AND GEO-SCIENCES

Book 2/1

APPLIED PHYSICS IN SERBIA-APS

**CONTRIBUTED PAPERS AND
ABSTRACTS OF INVITED LECTURES**



Editors:

S. Koički, N. Konjević, Z. Lj. Petrović and Đ. Bek-Uzarov

BELGRADE

2002

**APPLIED PHYSICS IN SERBIA
CONTRIBUTED PAPERS**



СРПСКА АКАДЕМИЈА НАУКА И УМЕТНОСТИ

НАУЧНИ СКУПОВИ

Књига ХСVШ

ОДЕЉЕЊЕ ЗА МАТЕМАТИКУ, ФИЗИКУ И ГЕО-НАУКЕ

Књига 2 / 1

ПРИМЕЊЕНА ФИЗИКА У СРБИЈИ-ПФС

ЗБОРНИК РАДОВА

И

АПСТРАКАТА ПРЕДАВАЊА ПО ПОЗИВУ

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PREFACE

This book contains the contributed papers and abstracts of invited lectures to be presented at the first conference Applied Physics in Serbia (APS). The meeting will be held in Belgrade on May 27th, 28th and 29th 2002 at the Serbian Academy of Sciences and Arts. It is organized by Serbian Academy of Sciences and Arts jointly with the Faculty of Physics, University of Belgrade, Institute of Physics Belgrade, Institute of Nuclear Sciences Vinča, Institute of Physics of the University of Novi Sad and the Physical Society of Serbia.

The conference has two goals. The first is to collect and evaluate the results of the half century of research and the second is to present the current status in the field of applied physics in Serbia. The historical review will be covered by a series of invited lectures presented orally at this conference. The ongoing research will be presented in the form of posters. Abstracts of invited lectures and contributed papers are published in Book 2/I of the proceedings. Complete manuscripts of the invited lectures will be published in the Book 2/II. The summary of round table discussions, comments on invited lectures and conclusions will also be included in the second volume.

The Organizers are grateful to the Ministry of Science, Technology and Development of Republic of Serbia and Ministry of Development, Science and Environment of Federal Republic of Yugoslavia and to NIS Rafinerija nafte Beograd and "Kryooprema" Belgrade for support.

The participants have been asked to send their papers camera ready, so the authors are responsible for the subject and the technical quality of the papers.

May, 2002

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**INVITED LECTURES
ABSTRACTS**

ATOMIC AND MOLECULAR PHYSICS

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ABSTRACT

The research in atomic and molecular physics has been done in Serbia on both fundamental and applied levels. Fundamental level includes theoretical and experimental research of atomic structures, dynamics, and interactions of atomic particles with other atomic species, surfaces or radiation. Much experience has been accumulated in sophisticated experiments where the knowledge of different technologies were acquired, like vacuum technologies, single photon and single electron counting techniques, small signal detection, low current measurements, residual magnetic fields measurements, etc. On this basis, a variety of applied projects have been realized. The application on fundamental level has been expressed through the use of obtained data, like cross section data, by the other fundamental disciplines such as laser physics, plasma physics, solid state physics, environmental physics or astrophysics.

One of the straightforward applications of the research in atomic and molecular physics was a construction of molecular species detectors at the ppm level of detection efficiency. Such devices were made for detection of SO₂, CO, CO₂, CH₄ and NO_x molecules. Physical techniques, such as induced fluorescence or linear photoacoustic spectroscopy (continual and pulse), were employed. One of such detectors was maintained at the power plant "Nikola Tesla" at Obrenovac for the monitoring pollutant gas concentrations. An ongoing experiment at the same plant is devoted to the utilization of electro-filters in deposition of flying ashes.

Another applicative product was an air-ion detector. A cylindrical Gerdien condenser was devised for simultaneous detection of both positive and negative air-ions with on-line connection

with a computer for the acquisition and storage of data. It could be used for both the urban pollution measurements and monitoring the quality of air in closed environments, like offices, or in open surroundings such as air in spas.

Important achievements were done in the usage of vacuum technology. Much effort was invested in establishing national standards for calibration of pressure gauges in regions of rough, medium and high vacuum. The training courses in industrial vacuum applications were established and several direct projects for the industry were done. As the result, the extensive monograph of the physics and techniques of vacuum was published [1].

Acquiring much of the cross section data, it was an impetus to try establishing a comprehensive information system in the field of atomic collision physics. The whole process of the research in the field was summarized in such system with the large database for the published data. Systematic analysis of needs and availability of data in atomic and molecular physics has been focused by several research groups in Serbia. Also, an expert system for analysis of electron-atom scattering energy loss spectra as well as an online expert system for analysis of inelastic electron scattering by metal atoms were developed. The same model is planned to be applied on spectra analysis of seismic waves (earthquakes or induced waves with the aim of searching for underground resources of oil, coal, water, etc.), nuclear magnetic resonance spectra, etc.

Several types of equipment have been developed for the scientific and technical education. These comprise air-ion detectors, laboratory equipment for student education and equipment for the exercises in vacuum technique.

These aspects of applications in atomic and molecular physics will be discussed at the meeting.

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