Proceedings
of the III International School and Symposium on Physics in Materials Science ISSPMS'98

Modification and Characterization of Materials Using Nuclear Methods

Jaszowiec, Poland, September 13–19, 1998

Part I

Editor of the Proceedings

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WARSAW

POLISH ACADEMY OF SCIENCES
INSTITUTE OF PHYSICS

The III International School and Symposium on Physics in Materials Science – Modification and Characterization of Materials using Nuclear Methods, was organized by the Institute of Atomic Energy, Świerk, in collaboration with the Andrzej Sołtan Institute of Nuclear Problems, Świerk.

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"nothing twice"
W. Szymborska
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Preface

Science opens mysteries of the world to the service of mankind. It resulted in the amazing development of human civilization and culture. Alas, it has also turned out to be the opening of the Pandora box of opposite good and bad winds — of always exciting, usually powerful, often opposite and sometimes devastating forces. There appears, therefore, a new task for scientists — to harness and tame these powers, to turn the enormous wealth of accumulated knowledge into materials, devices and ways of life friendly to men and to the planet, helping an affluent and healthy existence, as well as spiritual and intellectual enlightenment, of as many people as possible.

The philosophy of highest profit for any price is dangerous to the mankind. It becomes obvious that another attitude, aimed at long-lived, recyclable, safe, healthy, nature-friendly, inexpensive utilities, services, and systems would be beneficial to our civilization — that the world expects it from the contemporary science and technology. It is such a global perspective that the ISSPMS'98 should be looked at and valued.

Nuclear physics has given the mankind not only an understanding of nuclei and the nuclear power. Also, several unique techniques and machines, primarily designed to accomplish goals of fundamental research. Soon they have shown merits useful for the Materials Science — they can be used to investigate and modify materials and devices needed for development of our civilization.

Powerful accelerators of protons and electrons can either be applied to irradiate materials, or serve as means of producing strong beams of photons or other, more exotic particles, applicable for diagnostics of matter. Nuclear reactor radiation is commonly used to upgrade the properties of semiconductor materials, to enhance the beauty of jewels, to display the internal structure of engines, art objects, plant root systems, welds, etc., to produce radioactive isotopes. The isotopes can then be used for medical, technical and research purposes. Plasma beams are used to cut thick metal plates, to upgrade the hardness of mechanical tools. Thermal neutron beams are widely used to determine the crystal and magnetic structures and internal dynamics of materials; more recently, also for therapeutic purposes.

The first International School and Symposium on Physics in Materials Science took place in 1993, and dealt with implementation of nuclear methods in the study of materials and devices. The second one, in 1995, concentrated on the physical and technical aspects of the surface of materials. Both were organized by the Institute of Atomic Energy, with a generous support of several other institutes and institutions; both enjoyed the hospitality of the "Gwarek" hotel at Jaszowiec; the Materials of both were published in *Nukleonika* (Vol. 39, 1994) and *Acta Physica Polonica A* (Vol. 89, 1996).

The purpose of the III International School and Symposium on Physics in Materials Science has been to review the essential developments accomplished in last years in the above-mentioned fields, in order to open a wide gate between the needs of the Materials Science, aimed at new stable materials of special merits, and the opportunities created by nuclear and solid state physics, allowing one to characterize, understand, and modify the properties of matter. It has been a general opinion of the participants that the ISSPMS'98 has well served this purpose. We do hope that also the Readers will find this publication of its lectures and papers interesting and useful.

Julian Auleytner
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