

II. REPORTS ON RESEARCH

1 DEPARTMENT OF NUCLEAR REACTIONS



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Overview

Department of Nuclear Reactions has had a very productive year. We have carried out our work in close collaborations with physicists from many laboratories, home and foreign. The following reports cover three major domains of our activities: nuclear, material and atomic physics.

- Nuclear physics

In collaboration with scientists from Ukraine experimental studies of nuclear reaction induced by heavy ions from the Warsaw Cyclotron have been performed. The aim of the experiments is to study nuclear reactions leading to the exotic light nuclei in exit channels and energy dependence of the nucleus - nucleus interactions.

Proton induced charge-exchange reactions were investigated theoretically by means of multistep-direct model. Good agreement with the experimental data was achieved.

A novel approach to the problem of the nuclear liquid \rightarrow gas phase transition was proposed, based on synergetics – a domain of science dealing with self-organization in macroscopic systems.

Decay properties of the Roper resonance were studied. Final analysis of the analysing powers for the polarized deuterons scattered on protons was accomplished. Experimental programme of the near-threshold meson production in proton – proton scattering has been started in collaboration with Forschungszentrum Jülich.

- Atomic physics

Spectra of the X-rays emitted by energetic sulphur ions scattered off carbon atoms were analysed in order to study the role of the multiple charge states of the inner shells in the dynamics of the collision process.

Ionisation probabilities in collision of oxygen ions with gold atoms were measured. The observed disagreement of the experimental data with the theoretical predictions suggest a strong effect generated by the sub-shell couplings.

- Materials research

Ion channelling method was applied to investigate transformation of the defects in $Al_xGa_{1-x}As$ crystalline layers.

Activities of our colleagues in didactics have grown considerably. Lectures dedicated to nuclear physics, accelerators, detectors used in nuclear research as well as to nuclear methods used in solid state studies for students from many High Schools of Warsaw were given last year. Also, our Department made important contribution to the Scientific Picnic and the Science Festival, two events organized for young citizens of Warsaw.