

ON THE 100th ANNIVERSARY FROM THE BIRTH OF PROFESSOR MIKHAIL VASILIEVICH KOT

Professor M. V. Kot was a talented physicist-experimenter who entered the history of Moldovan science in the 20th century as the founder of the school of experimental semiconductor physics in the Republic of Moldova [1, 2].



Professor M. V. Kot
(1914-1967)

Biography: main stages

Mikhail Kot was born on November 15, 1914 in the village Bolshaya Alexandrovka, Kherson region (contemporary Ukraine) into a peasant family.

1933 – 1937 – student at the Faculty of Physics and Mathematics, Krivoy Rog Pedagogical Institute (teacher training college).

1937 – 1940 – being a high achiever, worked as an assistant lecturer at the Department of Physics at the same institute (in conformity with the decision of the State Commission for Placement of Graduates).

1940 – 1946 – enrolled in the Soviet Army participating in World War II (as a private and, at the end of the war, as a major), being on the roads of war from Moscow to Königsberg. Awarded with orders and medals for his military exploits.

1946 – 1953 – worked at the Department of electron-and-ion processes of the Chernovtsy State University.

1951 – defended his thesis for the scientific degree of the candidate of physics and mathematics at the Shevchenko Kiev State University.

1953 – 1967 – invited to work at the Kishinev State University (at present, Moldova State University) as Head of the Department of Experimental Physics (since 1955, the Electrophysical Department).

1966 – awarded the title of Full Professor.

1967 – died prematurely in the prime of his creative powers, because of a grave disease.

Scientific interests. Foundation of Moldovan school of experimental semiconductor physics.

Professor Kot was a model scientist and professor who skillfully combined research with education.

At the beginning of his scientific career, future professor Kot took a great interest in X-ray physics.

Being released from the Army, M. V. Kot successfully worked at the Chernovtsy State University in the area of electron optics. Mikhail Kot got deeply interested in a relatively young field of science—physics of semiconductors.

In those times, physics of semiconductors was a new area of science; however, one of the strong points of M. V. Kot was the scientific intuition, which enabled him to identify the main lines of physics research before other scientists from leading scientific centers of the USSR did.

M. V. Kot was a very energetic, ambitious, and courageous man. He manifested his courage not only in the time of war but also working in Chisinau, when organizing new educational and scientific laboratories, developing a new scientific direction without the necessary equipment and trained personnel. Thanks to his enthusiasm, perseverance and leadership qualities, he managed to create a team of the like-minded persons—young graduates who worked with him forgetting about time frames, holidays, and week-ends.

Professor M. Kot was very well aware of the importance of combining educational process with research, and he exerted plenty of effort there. An eloquent example was the creation of a team of five 3rd year students of the Kishinev State University in 1962, which was the result of a long and not always smooth debate with the university administration and the Ministry of Education. However, finally the team was allowed to be engaged in a special program and, with the addition of 6 months, to complete their graduation papers. Despite the fact that the results of this experiment were positive and all participants showed excellent knowledge at the state exam and presented original graduation works, the activities in this line were stopped by the bureaucracy of higher echelons. At that time, Professor M. Kot was seriously ill and had no forces to continue the debates with the Ministry of Education.



1955. Department meeting.



1956. At the exam.

It should be noted here that shortly after graduating from the university, all participants in the experimental team became doctors of sciences and three of them (P. Gashin, D. Neleoglo, and E. Senokosov) – doctors habilitate.

In the fifties of the last century, the prevailing view among scientists in semiconductor physics was that reliable results that can form the basis for the development of a theory and new physics mechanisms can be obtained only in bulk crystals with a perfect structure. Initially, at the Department of Experimental Physics headed by Associate Professor M. Kot, research was also carried out on bulk polycrystalline and single-crystalline samples, namely, CdSb (I. Andronic, E. Arushanov), ZnSb (I. Cretsu), and Sb_2Se_3 (S. Shutov) [3- 6]. The obtained results allowed the researchers of the Electrophysical Department to participate in scientific conferences and get acquainted with the leading scientists of the USSR. Particularly strong links were established with the Ioffe Physical-Technical Institute of the Russian Academy of Sciences and its researchers: Lenin Prize winner Professor D.N. Nasledov, whose work contributed to the creation of semiconductor lasers, Professors B. T. Kolomiets and N. A. Goryunova, who were the first to obtain and investigate amorphous semiconductors, as well as with other scientists from Moscow and Kiev.



1963. Professors D.Nasledov and A.Regel in Electrophysical Department.

Prof. D. N. Nasledov was a frequent visitor to Chisinau. Prof. Nasledov, on the one hand, and professor Kot with his disciples, on the other hand, were engaged in a heated debate about the importance of the study of thin films. Initially, Prof. Nasledov did not take this subject seriously; however, when in the middle of the 1950s the Chisinau Department researchers obtained and investigated thin films of group II-VI (A. Simashkevich, V. Tyrziu) and group III-V compounds (V. Casian, Iu. Maronciuc), he changed his opinion and even began to support those investigations.

To single out the most important ideas and achievements of the students and researchers of the Electrophysical Department of the Kishinev State University under the leadership of professor Kot, the following should not be omitted.

First comes, undoubtedly, the area of physics and technology of semiconductor thin layers. Despite the fact that many leading scientists considered the future of physics of semiconductors and semiconductor devices to be related only to single crystals of high purity and

perfection, M. V. Kot persistently defended the importance of the study of thin semiconductor films. Thus, under his leadership, in 1954 the collaborators and students of his Department started to work in the direction of preparation and investigation of thin layers of II-VI and III-V semiconductor binary compounds. These works were among the first in this field in the USSR and maybe in the world. To prepare these layers, on the initiative of Prof. Kot, the researchers applied the method for preparing and analyzing metallic alloys developed by S. A. Vekshinski (for which he received the USSR State Prize in 1946).

In the case of applying that method for semiconductors, two different components of a binary compound are evaporated from two different sources on a heated substrate, where they form the desired compound. For example, the evaporation of cadmium and selenium on a glass substrate heated to 300°C makes it possible to obtain a pure CdSe layer, because the excessive Cd and Se atoms could not be condensed on a heated substrate [7]. Other thin films of II–VI compounds have also been prepared and studied [8-10]. If the substrate is cold, a layer of variable composition ranging from pure cadmium to pure selenium with a narrow cadmium selenide band is formed. If, using the above described method, binary compounds are evaporated instead of elementary components, then thin layers of variable compositions, consisting of a continuous series of solid solutions based on the used compounds, can be prepared. In this way, the synthesis of a large number of bulk samples is not necessary to establish the dependence of the optical and electrical parameters of ternary solid solutions on their composition [11, 12]. Unfortunately, this method of thin film deposition was not patented at that time, and a few years later another researcher offered it with slight modifications under the title "Three-temperature method" [13], which nowadays is a universally accepted term.

Another important area the research in which began in 1961 on the initiative and under the management of M. V. Kot was the problem of obtaining and investigating semiconductor heterojunctions. In those years, not only the Soviet but also foreign researchers prepared and studied heterojunctions based on II–VI compounds, such as CdSe–ZnTe, ZnSe–CdTe, and ZnSe–ZnTe. First results on the study of the electrical and photovoltaic properties of these heterojunctions were published in 1964 [14], while in 1965 the injection electroluminescence was obtained in heterojunctions formed by II–VI compounds for the first time [15]. It was the injection of minority carriers in the wide-band component of the heterojunction rather than the usual injection in the narrow-band component.

Photo-thermoplastic recording of optical information was another important research direction initiated at the Department of the State University headed by Prof. Kot in Chisinau in the 1960s. The developments of those studies led to setting up of a specialized research laboratory of photo-thermoplastic recording at the State University.

At the University, Professor Kot not only organized, promoted, and was personally deeply involved in experimental research into semiconductor physics; moreover, he was the first in Moldova, and very active, mentor in training students, young specialists for this area.

During 14 year of his leadership in the department, the University trained more than 300 highly skilled specialists, 20 of his first disciples became doctors habilitate, including 6 academicians (A. Andries, D. Ghitsu, M. Bologa, S. Radautsan, A. Simashkevich, and A. Arushanov) and one corresponding member (I. Geru) of the Academy of Sciences of Moldova. All that has contributed to the fact that physics of semiconductors has become the leading branch of physical science in the country and continues to progress at the Moldova State University, the Institute of Applied Physics of the Academy of Sciences of Moldova, the Technical University of Moldova, the Tiraspol University, and in many other scientific and educational institutions in Moldova and abroad.

The list of publications by Professor M. V. Kot and with his participation can be found in [1].

Professor Kot is not with us today, he is gone failing to realize completely his potentialities and creative power in science and education. However, he did succeed in creating a school of semiconductor physics in the Republic of Moldova.

He is survived by his son Mikhail, a military officer, and his daughter Natalia, a physicist.

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