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TO THE 110-th ANNIVERSARY OF ANTONINA FEDORIVNA PRIKHOT'KO'S BIRTHDAY (1906–1995)



Academician of the National Academy of Sciences of Ukraine, Hero of Socialist Labor, winner of State Prizes, Honored worker of science Antonina Fedorivna Prikhot'ko left a deep trace in the memory of the scientific community as an outstanding scientist with the world-recognized reputation in solid state physics and spectroscopy, as well as a talented tutor of the creative scientific youth. The results of her work remain actual till nowadays.

Antonina Fedorivna Prikhot'ko was born on April 26, 1906, in the town of Pyatigorsk. Antonina Fedorivna began her creative way to science, when being a student of the Leningrad Polytechnic Institute. In 1930, with a group of scientists, she moved to Kharkiv in order to create a new center of physical science in Ukraine, the Ukrainian Physico-Technical Institute (UPTI). Academician of the AS of the USSR I.V. Obreimov became the first director of the UPTI.

In Kharkiv, a cryogenic laboratory, the first in the Soviet Union and Ukraine, was established, and the methodology of low-temperature spectral researches

of molecular crystals was elaborated. The consideration of crystal spectra was based at that time on the so-called "oriented gas" model, according to which the molecular crystal was regarded as a structure of molecules that are arranged in a certain way, but not interact. Within 1930–1940 in Kharkiv, A.F. Prikhot'ko successfully performed low-temperature researches in a variety of organic and inorganic crystals, including cryocrystals, the substances that crystallize only at very low temperatures. She demonstrated for the first time that the structure of absorption spectra of a molecular crystal differs from the structure of the spectrum of an isolated molecule by the presence of additional bands, which she called "crystalline". Further, those bands were interpreted as a manifestation of excitons, a specific state of electron excitations in crystals.

In 1943, Antonina Fedorivna successfully defended her thesis for Doctor's degree in physics and mathematics and became the first woman in the Soviet Union with this scientific rank. During the World War II, the Academy of Sciences of the Ukrainian SSR was evacuated to the town of Ufa, where Antonina Fedorivna headed a laboratory at the Institute of Physical Chemistry, in which important works for the needs of the front were carried out.

In 1944, after Ukraine had been liberated from the Nazi occupation, A.F. Prikhot'ko started her activity at the Institute of Physics of the AS of the UkrSSR (Kyiv) on the creation of a cryogenic laboratory, the second one in Ukraine. Here, for the first time in the world, the fundamentals of modern cryogenic engineering and corresponding measuring systems for spectral and other researches were also laid. The fabrication of metallic optical cryostats for liquid nitrogen, hydrogen, and helium temperatures was also organized for the first time.

Simultaneously, essentially new results of the fundamental character were obtained by Antonina Fedorivna, while researching low-temperature spectra of the crystals of some aromatic compounds in the polarized light. A.F. Prikhot'ko possessed a priority

in the experimental detection of the excitonic character of light absorption by molecular crystals. Those experimental results and the corresponding theoretical works by O.S. Davydov began a new direction in solid state physics, physics of excitons in non-metallic crystals.

A large cycle of experimental works, which covered various aspects of the interaction between non-metallic crystals and light – absorption, reflection, luminescence, dispersion, and others, – was carried out at the Institute of Physics under the direction of A.F. Prihot'ko. Antonina Fedorivna together with her disciples elucidated the role of defects and deformations in crystals and established a relation between their spectra and the crystal structure. The researches of the influence of impurities and defects in the lattice on the crystal luminescence resulted in the discovery of exciton luminescence by Academician of the NAS of Ukraine M.T. Shpak. A method to analyze the structure of exciton bands in molecular crystals was elaborated, and the role of excitons in the photoconductivity of organic crystals was clarified.

A.F. Prihot'ko together with the collaborators of the department and the theorists from M.M. Bogolyubov Institute for Theoretical Physics of the NAS of Ukraine performed important researches of the spectra of various modifications of crystalline oxygen. As a result, the unknown earlier exciton-exciton interactions were discovered. Those interactions give rise to the emergence of complex quasiparticles: bi- and polyexcitons, as well as to the simultaneous excitation of magnons and phonons.

In 1965, Antonina Fedorivna organized the all-Union seminar "Excitons in crystals", which was held annually till 1987. The seminar promoted the association of scientists from various republics of the USSR, who researched excitons in molecular and semiconducting crystals. It was also a true school for the scientific youth. Later, A.F. Prihot'ko organized the Republican seminar "Cryocrystals". At the Institute of Physics, she chaired the joint seminar of all solid-state departments. In 1965–1970, Antonina Fedorivna was a successful director of the Institute of Physics of the UkrSSR.

During spectral researches, there appeared new directions of investigations, which have been successfully developed till now. They concern not only molecular crystals, but also semiconductors, anti-

ferromagnets, and so on. Antonina Fedorivna initiated the creation of new departments and laboratories at the Institute of Physics, which were headed by her disciples, such as Academician of the NAS of Ukraine M.S. Brodyn, Professor V.L. Broude, Academician M.T. Shpak, and others.

In 1963, under the aegis of A.F. Prihot'ko, the scientists of the Institute of Physics began researches on the influence of intensive laser radiation on the optical properties of insulators, semiconductors, and dyes solutions. This activity gave impetus to the development of a new direction, nonlinear optics of various media. As a result, lasers with the variable wavelength generation were created for the first time (Professor V.L. Broude, Corresponding member of the NAS of Ukraine M.S. Soskin).

In 1966, also on the initiative of A.F. Prihot'ko, the researches in optical holography were started. Novel registration media for holography were developed (Professor V.B. Markov), and effective holographic gratings on the basis of a number of ferroelectric and semiconducting substances were obtained (Corresponding member of the NAS of Ukraine S.G. Odoulov). The researches of mechanisms for recording stationary and dynamic holographic gratings were carried out (Academician of the NAS of Ukraine M.S. Brodyn, Corresponding member of the NAS of Ukraine M.S. Soskin).

A.F. Prihotko actively promoted the development of new techniques for crystal researches, such as low-temperature high-frequency spectroscopy, X-ray diffraction analysis of crystals, ultra-fast laser optics, high-temperature superconductivity, as well as cryobiology and cryomedicine.

For many years, the department headed by Antonina Fedorivna together with the scientists of the Institute of Neurosurgery actively worked in the domain of creating a special equipment for cryobiology and cryosurgery (Professor T.P. Ptukha, Head of A.B. Rikberg laboratory). Those devices were awarded at several exhibitions; they were patented in the USA and UK. In collaboration with other institutions, a number of cryogenic apparatus were created and practically applied in many oncological and other treatments.

The scientific school founded by Antonina Fedorivna continues its fruitful functioning and active development. The school forms new branches and expands the scope of researches in new directions. The

Department of Crystal Physics created by Academician A.F. Prihot'ko is now headed by her grandson Professor Yu.O. Reznikov. Today, the range of department's activity includes the physics of liquid crystals, nonlinear optics of metallic and semiconducting nanocrystals (Professor G.V. Klimusheva), and the theory of superconductivity (the leading research associate O.M. Gabovich).

The traditions of Prihot'ko's scientific school are kept by her disciples and the disciples of her disci-

ples, which perform their scientific researches at the Institute of Physics and other scientific institutions of Ukraine. The life of Antonina Fedorivna Prihot'ko and her scientific deed are a worthy example for the youth that choose a way to serve science.

*Academician of the NAS of Ukraine
Corresponding Member
of the NAS of Ukraine
Professor*

*M.S. BRODYN,
M.S. SOSKIN,
G.V. KLIMUSHEVA*