

Leonid N. Rashkovich (1931 – 2021)



Leonid N. Rashkovich, Doctor of Sciences in Engineering, Professor of Lomonosov Moscow State University passed away after a grave illness on 23 June 2021. In 1954 after graduating from Moscow University of Chemical Technology he was appointed a senior researcher at Moscow Institute of Construction Materials. He worked there successfully for 10 years. There he wrote and defended his PhD thesis. In 1964 academician A.V. Shubnikov invited him at the Faculty of Physics of Lomonosov Moscow State University. Though L.N. Rashkovich was doing research in various spheres, all of them were connected with the physics of crystallization processes. He studied the peculiarities of growing LiNbO₃:Nd crystals, examined the special

features of forming of the LiNbO₃ domain structure. Later he became interested in KDP crystals. He discovered new phenomena in the process of KDP crystallization, defined the conditions for existence of tetragonal and monoclinic phases of K(D_xH_{1-x})₂PO₄, discovered the interconnection between solubility, crystal growth rate and solute composition H₂O (D₂O). Besides he discovered new phases and defined the characteristics of solutions and crystals in A₂O-B₂O₅- (D_xH_{1-x})₂O (A = K, Rb, Cs; B = P, As systems. In 1981 Leonid Rashkovich defended with great success a Doctor of Science thesis on the topic “Crystallization in D₂O and H₂O solutions”. The thesis contained the results of the vast scientific research which had been carried out for over 10 years. It tackled the issues connected with the studies of the isotope exchange equilibrium between a crystal and saturated solution, the studies of phase balance and crystallization kinetics. In the early 80s Leonid Rashkovich was the first to create an interference method for *in situ* quantity characterization of the growing surface and the near-surface layer morphology in the stirred solution. He applied this method to study the dislocation growth of a wide range of crystals such as KDP, TGS, KAP, Ba(NO₃)₂ and lithium

formate. It was this method which allowed L.N. Rashkovich and his colleagues to check by experiment the theory of spiral crystal growth and to change the basic criteria which define this growth: the step edge free energy, kinetic coefficients and the activity of dislocation growth sources. The observation of the step generation caused by elementary and complex dislocations sources which was carried out with the help of the interference method *in situ* allowed to define the shape of vicinal hillocks on different faces of crystals under examination. Besides the research allowed to determine the impact of impurity types on the loss of the surface morphology stability depending on supersaturation, the impurity concentration and the solution flow velocity. The results of the fundamental scientific research accomplished by L.N. Rashkovich laid the foundation for developing the technology for the fast growth of KDP crystals from solutions. This work was done in cooperation with researcher N.P. Zajtseva and postgraduate A.T. Amandosov. Against the background of supersaturation there were conditions for the morphological stability of the growing crystal face due to the high purity of the initial chemicals, to specific conditions of the seed regenerating and due to the peculiarities of hydrodynamic growth modes. The appearance of the AFM method allowed Leonid Rashkovich to pass over to the research and visualization of the morphology of growing protein crystals' faces. For the first time the kinks of the elementary steps were visualized and their characteristics and density were measured. As a result it became possible to discover and understand the weak fluctuation of steps alongside with the low density of kinks. Besides it was demonstrated that in this situation it's impossible to apply the Gibbs-Thompson law which links the step segment rate to its length. This made it possible to develop and test by experiment the growth model for non-Kossel crystals. This model allows to find out the type of the building units.

For his outstanding scientific discoveries and achievements Leonid Rashkovich was awarded R&D 100 Awards, USA (1994) and Laudise Prize of International Organization for Crystal Growth (2010). He was also awarded the title of Professor Emeritus of Lomonosov Moscow State University (2011).

Leonid Rashkovich was the author and co-author of more than 150 scientific articles, two books which were translated into foreign languages and 10 patents. The book "KDP-family single crystals" is very popular with professionals who deal with growing KDP crystals. For over 40 years he gave lectures at the Chair of Physics of Polymers and Crystals. His lectures in the subject "The Crystal Growth"

were always attention-grabbing and memorable. Besides he was a thesis supervisor for 24 postgraduates.

Moreover, Leonid Rashkovich did a lot of social work. For many years he was a member of the editorial board of journal “Crystallography Reports” (1990-2007), he was a member of two thesis Councils (at the Prokhorov General Physics Institute of Russian Academy of Sciences of and at the Faculty of Physics of Lomonosov Moscow State University). Besides, he was a member of over 20 organizing committees for national and international conferences devoted to the growth of crystals.

Leonid Rashkovich had inquisitive mind and was a brilliant researcher. Besides, he was just an outgoing, understanding and kind person. At the same time he had a strong willpower and was committed to the goals he set, ready to overcome any difficulties for the sake of achieving the aim. His death is a great loss both for the Russian and global science. We are giving our condolences to the family, colleagues and all those people who knew Leonid Rashkovich.