



Condensed Matter and Interphases

Kondensirovannye Sredy i Mezhfaznye Granitsy
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Professor Mahammad B. Babanly's anniversary



In January, Mahammad B. Babanly, an outstanding scientist and our good friend, celebrated his 70th birthday.

Babanly was born in 1952. In 1968–1973 he studied at the Faculty of Chemistry of Baku State University, graduated with honours, and enrolled on a PhD programme. In 1977 he defended his PhD thesis at Belarusian State University, and in 1988 he defended his doctoral thesis in the field of “inorganic chemistry” at Moscow State University. In 1990 Babanly gained the title of full professor.

At Baku State University he has worked as a junior researcher (1977–1979), senior researcher (1979–1983), lecturer (1983–1986), associate professor (1986–1989), and professor (1989–1994). From 1992 to 1994 he was vice-rector at Baku State University. In 1994–2005 he was head of the Department of General and Inorganic Chemistry at Baku State University, and from 2006 to the end of March of 2014 he was a professor at this department and scientific supervisor of the “Inorganic material science” research laboratory. At the Institute of Catalysis and Inorganic Chemistry, Azerbaijan National Academy of

Sciences, he was deputy director for research from 2014 and became executive director in 2021.

Professor Babanly is a renowned scientist who has created a new scientific field and a scientific school in the field of chemistry, thermodynamics, and material science of complex inorganic semiconductors. In the late 1970s, he was the first to introduce the EMF method into the traditional set of methods for the study of phase equilibria (PE) of three-component semiconductor systems and started a new comprehensive approach to the study of their PE and thermodynamic properties (TP). As part of this approach, he developed a thermodynamically strict method for the calculation of integral thermodynamic functions of ternary and more complex condensed phases based on the partial molar quantities of one of the components and the phase diagram of the corresponding system. Continuing to develop this field of study, he was the first to use solid electrolytes with cationic conductivity for the physicochemical study of complex semiconductor chalcogenides in the late 1980s. Thus he significantly expanded the possibilities of the EMF method so it could be applied to many systems that could not be studied using the traditional version of this method. He also found a new type of potential formation reactions in complex concentration cells and developed a technique for their practical application in thermodynamic studies.

Regular comprehensive studies of the PE and TP of complex semiconductor systems have been conducted under the supervision of Mahammad B. Babanly for over 30 years. For the first time, a set of consistent data on PE and TP was obtained for over 100 three-component chalcogen-containing systems based on thallium, copper, and silver, while dozens of quaternary and quinary systems were studied along stable planes (quasi-ternary and mutual systems). Multiple new compounds and phases of variable compositions



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were discovered, and the researchers established the nature of their formation, homogeneity regions, types and parameters of the crystal lattice, standard thermodynamic functions of formation, thermodynamic functions of melting and polymorphic transformations, as well as other properties.

Over the last 10 years, Professor Babanly and his colleagues have also been developing physicochemical bases for obtaining ternary and more complex chalcogenide phases that are topological insulators. Comprehensive studies of single crystals of a series of such phases that were grown by them together with their colleagues from EU countries and Japan showed that it is a promising solution for the new generation quantum computers and spintronics.

The issues raised in the works of Professor Babanly are highly important for the development of fundamental inorganic chemistry and, in particular, physicochemical analysis, chemical thermodynamics, and material science of complex inorganic systems.

Babanly has published more than 1,000 research papers, including 4 monographs, over 550 articles, and 5 patents. Over 200 articles have been published in the international journals included in Science Citation Index

(Nature Communications, Journal of Alloys and Compounds, Physical Review Letters, Physical Review B, Mettalkunde, International Journal of Materials Research, and journals of the Russian Academy of Sciences, such as Russian Journal of Inorganic Chemistry, Inorganic materials, Physical Chemistry Journal, Electrochemistry, and others). He has also repeatedly presented his reports at numerous international and regional scientific conferences.

Most scientific results obtained by Professor Babanly and his colleagues have been included into such fundamental reference works as “Phase equilibria diagrams”, “Ternary alloys”, “State diagrams of metal systems”, etc., as well as into the databases of the information agencies Springer, Elsevier, Tomson Reuters, and others.

M. Babanly continues to form and develop his own scientific school. He has supervised 2 doctoral dissertations and 35 PhD theses. Among the scientists with a PhD degree supervised by him are researchers from Syria, Afghanistan, Vietnam, and Korea.

M. Babanly maintains close academic connections with many research organisations of the European Union, Japan, Russian Federation, and Ukraine resulting in numerous joint publications.

Professor Babanly actively participates in the scientific and social life of the Republic of Azerbaijan. In previous years he was a member, the chair, and deputy chair of the Expert Board on Chemistry of the State Commission for Academic Degrees under the President of the Republic of Azerbaijan, a member of the Academic Council of Baku State University as well as several dissertation boards. At present, he is the member of the dissertation board at the Institute of Catalysis and Inorganic Chemistry and the editorial boards of the Turkish Journal of Chemistry, Russian Journal of Inorganic Chemistry, Condensed Matter and Interphases, Physics and Chemistry of Solid State, New Materials, Compounds and Applications and Chemical Problems, and Azerbaijan Chemistry Journal.

In 2000, he was awarded with a Taraggi Medal by the Decree of the President of the Republic of Azerbaijan. In 2011 he received a prize and a diploma of the Praesidium of the Russian





Academy of Sciences for a series of research articles published in the journals of the Russian Academy of Sciences.

In 2016, he was awarded with the Thomson Reuters Special Prize for the most cited "Outstanding Scientific Article".

In 2016, he won the "Scientist of the Year" competition held by the Science Development Fund under the President of the Republic of Azerbaijan.

He also received diplomas from the Russian Journal of Inorganic Chemistry as the author of the most cited articles in 2019 and 2020.

For his scientific achievements he was repeatedly awarded with honorary certificates by the Ministry of Education of the Republic of Azerbaijan, the Department of Chemistry of Azerbaijan National Academy of Sciences, and the rector of Baku State University.

Mahammad B. Babanly is a long-time friend of the Faculty of Chemistry who has come to

Voronezh many times and acted as the chair of the Physicochemical Analysis section of the All-Russian Conference with International Participation "PHYSICAL AND CHEMICAL PROCESSES IN CONDENSED MATTER AND INTERPHASE BOUNDARIES". He has repeatedly presented plenary reports that were memorable, attracted great interest, and were discussed by scientists from various cities of Russia for a long time. We are grateful to M. B. Babanly for his active work on the editorial board of the journal "Condensed Matter and Interphases" as an editor, reviewer, and author. Thanks to him, the editorial portfolio includes articles by his colleagues from Azerbaijan that are cited in international scientific databases. We hope that no outside challenges will interfere with our cooperation and future meetings.

We would like to congratulate Professor Mahammad B. Babanly on his 70th birthday and wish him good health, success, and new achievements in his further endeavours!

The team of the Faculty of Chemistry of Voronezh State University,

The Editorial Board of the journal Condensed Matter and Interphases

Translated by Marina Strepetova