

MEMORABLE DATES

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A.S. Masalimov as the founder and leader of a new direction in ESR spectroscopy and quantum chemistry of free radicals

The article highlights the creative path of A.S. Masalimov, an outstanding Kazakhstan chemist who celebrates his 70th anniversary in 2022. The main stages of his career and significant events of his scientific career are presented here. The contribution of professor A.S. Masalimov in the foundation and development of the school of ESR spectroscopy and quantum chemistry at the Karaganda Buketov University is shown.



The anniversary of the scientist is a good reason to sum up what he has done, to see the significance of his works in the research area. Abay Sabirjanovich Masalimov, Doctor of Chemical Sciences, Professor, the founder and leader of a new direction in ESR spectroscopy and quantum chemistry of free radicals, is a scientist whose works are widely known in Kazakhstan science. His name is associated with the development of a modern model of protolytic processes in acid-base systems with intermolecular hydrogen bonds.

Abay Sabirjanovich was born in the Vvedenka village, Mendykara district, Kostanay region, on January 7, 1952. After school, he entered Kazakh State University named after S.M. Kirov in Almaty, which he successfully graduated in 1974.

After graduation from the university, Masalimov A.S. was sent to the Zhambyl Technological Institute according to the assignment. In 1974–1976 he worked in the ESR-spectroscopy laboratory of the Institute of Organoelement Compounds of the USSR Academy of Sciences in Moscow as a research assistant from the Zhambyl Technological Institute. At this time Masalimov A.S. and his colleagues obtained the kinetic parameters of reversible proton transfer between semiquinone radicals and primary and secondary amines, and also discovered the phenomenon of non-degenerate tautomerism in 3,5-di-tert-butyl-2-chloro-6-hydroxyphenoxy. These were his most significant achievements of that period [1–3].

During the internship, A.S. Masalimov under the leadership of Academician of the USSR Academy of Sciences, M.I. Kabachnik, prepared a candidate dissertation in chemistry entitled: “ESR study of reversible proton transfer reactions” on the 02.00.04 — Physical Chemistry specialty. The defense of the thesis took place at one of the first dissertation councils opened after the reform in Kyiv city in 1978. In 1976–1978 Masalimov A.S. worked as a teacher at the Department of Physical Chemistry of the Zhambyl Technological Institute, then returned to the Institute of Chemical Sciences of the Kazakh SSR Academy of Sciences in Alma-Ata. Here he worked for about three years as a junior researcher at the Laboratory of Physical Methods of Research.

All further job and scientific activities of Masalimov A.S. inseparably linked with the Karaganda State University, where he was invited by the rector Muldakhmetov Z.M. Since 1980 Masalimov A.S. worked at

various positions of the Chemical Faculty of Karaganda State University: as a Senior Lecturer, then as an Associate Professor of the Physical Chemistry Department, as the Head of the Quantum Chemistry Department, and after the faculty reorganization, as the Head of the Physical and Analytical Chemistry Department, as well as the Dean of the Chemical Faculty. In 2001–2005, Masalimov A.S. was the vice-rector of scientific work in the Buketov Karaganda State University. In 2005–2021, he headed the Physical and Analytical Chemistry Department of the Buketov Karaganda State University.

In 1993, Masalimov A.S. successfully defended his doctoral dissertation in chemistry entitled: “Rapid reactions of proton transfer and exchange in semiquinone radicals” on the 02.00.04 — Physical Chemistry specialty. In 1996, he was awarded the title of professor by the Higher Attestation Commission of the Republic of Kazakhstan. In 2002, Masalimov A.S. became an academician of the Kazakhstan Higher Education Academy of Sciences, and in 2005, he became an academician of the International Higher Education Academy of Sciences.

The authority of a scientist in the research community is also can be confirmed by his membership in dissertation councils. For many years, Masalimov Abay Sabirjanovich was a member of doctoral dissertation councils on the Physical Chemistry specialty in the Buketov Karaganda State University and Al-Farabi Kazakh National University. Currently, A.S. Masalimov is the Chairman of the dissertation council on the 6D060600 — Chemistry specialty (8D05301 — Chemistry educational program) in the Buketov Karaganda University.

The scientific interests of Abay Sabirjanovich have always been focused on the key problems of chemical science. His research style is characterized by broad scope and innovation, combined with the precision of an experimental solution. He founded the school of ESR spectroscopy and quantum chemistry at the Karaganda State University. Acid-type spin probes with a wide range of kinetic characteristics were obtained from the different structure stable semiquinone radicals for the study of non-aqueous media [4–6]. Using dynamic ESR spectroscopy and semiquinone spin probes, a technique for determining the rates of rapid protolytic processes in non-aqueous solutions of organic compounds was developed by A.S. Masalimov. The developed technique allows to obtain such paramount characteristics of substances as kinetic basicity and acidity [7–12]. A new theory of proton transfer in intermolecular hydrogen-bonded acid-base systems taking into account the primary elementary act of one-electron transfer was presented by A.S. Masalimov [13].

Our faculty has become one of the leading research centers for chemistry in Central Kazakhstan, a real forge of scientific and pedagogical personnel in the country owing to the high professionalism of Abay Sabirjanovich, his talent as a leader and teacher, dedication and strategic vision of the situation.

A.S. Masalimov, heading a number of significant scientific research, formed a powerful scientific school at the Chemical Faculty. Under his supervision 1 doctor of chemical sciences, 9 candidates of chemical sciences, 1 doctor of PhD and more than 22 masters of science defended their dissertations.

The fruitful scientific activity of Abay Sabirjanovich found its ESR presentation in more than 260 scientific works, including 2 textbooks and numerous publications in the authoritative world scientific databases such as Web of Science and Scopus. At present, the monograph “ESR spectroscopy of protolytic processes” is being prepared for publication, which is the result of many years of scientific research and experiments. His papers are an example of the originality and courage of scientific thought, and his hypotheses are always proven and convincing.

The merits of the celebrant were repeatedly noted at the highest level. In 2005, Masalimov A.S. was awarded the medal “For Merit in the Development of Science” of the Ministry of Education and Science of the Republic of Kazakhstan. In 2006, he became the owner of the grant of the Ministry of Education and Science of the Republic of Kazakhstan “The best teacher of the university”. In 2012, he was awarded the title of Honored Worker of the Buketov Karaganda State University. In 2018, he was awarded the Medal “Excellence in the Chemical Industry of the Republic of Kazakhstan”.

More than 40 years, Masalimov Abay Sabirjanovich has been working at the Buketov Karaganda University. Over the years, he has gone from Senior Lecturer to Dean, Vice-rector for scientific work, Chairman of the dissertation council. Scientific authority, broad erudition, a high degree of professionalism and organizational skills of Abay Sabirjanovich are known and recognized not only in Kazakhstan, but also abroad.

On behalf of the labor collective of the Chemical Faculty of the Buketov Karaganda University, we congratulate Professor A.S. Masalimov on his 70th birthday and express our deep gratitude for his many years of work in our team! We wish Abay Sabirjanovich good health, creative longevity, new scientific achievements, grateful students and followers!

References

- 1 Масалимов А.С. О реакциях протонного обмена и переноса с участием 4,6-ди-трет.бутил-3-хлор-2-оксифеноксиле / А.С. Масалимов, А.И. Прокофьев, С.П. Солодников, Н.Н. Бубнов, М.И. Кабачник // Изв. АН СССР. Сер. хим. — 1978. — Т. 27, № 1. — С. 210–213.
- 2 Масалимов А.С. ESR Исследование методом ЭПР протонного переноса от 3,6-ди-трет.бутил-2-оксифеноксила к первичным и вторичным аминам / А.С. Масалимов, А.И. Прокофьев, Н.Н. Бубнов, С.П. Солодников, М.И. Кабачник // Изв. АН СССР. Сер. хим. — 1977. — Т. 26, № 4. — С. 696–700.
- 3 Масалимов А.С. Невырожденная таутомерия в свободных радикалах. Внутримолекулярная миграция атома водорода в 4,6-ди-трет.бутил-3-хлор-2-оксифеноксиле / А.С. Масалимов, А.И. Прокофьев, Н.Н. Бубнов, С.П. Солодников, М.И. Кабачник // Докл. АН СССР. — 1977. — Т. 236, № 1. — С. 116–119.
- 4 Масалимов А.С. ЭПР-исследование влияния добавок воды на кинетику протонного переноса и обмена в растворах семихинонных радикалов / А.С. Масалимов, К.Т. Бажиков, Л.Э. Мельбардис, А.И. Прокофьев // Изв. РАН. Сер. хим. — 1994. — Т. 43, № 6. — С. 953–956.
- 5 Масалимов А.С. Кинетика протонного переноса между семихинонными и нитроксильными радикалами / А.С. Масалимов, С.Н. Никольский, И.И. Дмитриев, А.И. Прокофьев, З.М. Мулдахметов // Изв. АН СССР. Сер. хим. — Т. 40, № 1. — С. 53–57.
- 6 Масалимов А.С. ЭПР-исследование кинетики протонного переноса в вязких средах / А.С. Масалимов, С.Н. Никольский, А.И. Прокофьев, З.М. Мулдахметов // Изв. РАН. Сер. хим. — 1992. — Т. 41, № 9. — С. 1563–1566.
- 7 Масалимов А.С. ЭПР-исследование протонирования замещенных трехчленных азотистых гетероциклов / А.С. Масалимов, С.Н. Никольский, А.А. Ходак, А.И. Прокофьев, З.М. Мулдахметов, Р.Г. Костяновский // Изв. АН СССР. Сер. хим. — 1991. — Т. 40, № 1. — С. 47–52.
- 8 Масалимов А.С. Таутомерия в ионных парах семихинонных анион-радикалов с аммониевыми катионами / А.С. Масалимов, С.Н. Никольский, О.Д. Кемалов, А.И. Прокофьев, З.М. Мулдахметов // Теоретическая и экспериментальная химия. — 1991. — Т. 27, № 2. — С. 184–188.
- 9 Масалимов А.С. Протолитические реакции 3,6-ди-трет-бутил-2-оксифеноксила с азотистыми основаниями / А.С. Масалимов, А.А. Тур, С.Н. Никольский // Теоретическая и экспериментальная химия. — 2016. — Т. 52, № 1. — С. 57–65.
- 10 Masalimov A.S. Quantum-chemical investigations of the dual protolytic activity of several semiquinone radicals / A.S. Masalimov, A.A. Tur, A.E. Tuktybayeva, S.N. Nikolskiy // Bulletin of the University of Karaganda – Chemistry. — 2015. — № 77. — P. 51–56.
- 11 Nikolskiy S.N. Investigation of intermolecular proton exchange of 3,6-di-tert-butyl-2-oxyphenoxyl with N-phenylanthranilic acid by ESR spectroscopy method / S.N. Nikolskiy, F.Z. Abilkanova, A.S. Golovenko, I.A. Pustolaikina, A.S. Masalimov // Bulletin of the University of Karaganda – Chemistry. — 2020. — № 98. — P. 35–41.
- 12 Nikolskiy S.N. Investigation of intermolecular proton exchange 3,6-di-tert-butyl-2-hydroxyphenoxyl with phenol by ESR spectroscopy method / S.N. Nikolskiy, A.A. Tur, A.A. Yelchibekova, K.Z. Kutzhanova, A.S. Masalimov // Bulletin of the University of Karaganda – Chemistry. — 2015. — № 77. — P. 47–50.
- 13 Масалимов А.С. Кинетические аспекты теории кислот и оснований М.И. Усановича / А.С. Масалимов // Исследование кислотно-основного взаимодействия в двойных и тройных системах: Сб. науч. тр. КазГУ им. С.М. Кирова. — Алма-Ата, 1984. — С. 92–96.

С.Н. Никольский, И.А. Пустолайкина

А.С. Масалимов — бос радикалдардың ЭПР-спектроскопиясы мен кванттық химиясы атты жаңа бағыттың негізін қалаушы, жетекшісі

Мақалада 2022 жылы 70-жылдық мерейтойын атап өтетін көрнекті қазақстандық химик ғалым А.С. Масалимовтың шығармашылық жолы баяндалған. Еңбек қызметінің негізгі кезеңдері мен ғылыми жолындағы елеулі оқиғалары көрсетілді. Профессор А.С. Масалимов академик Е.А. Бөкетов атындағы Қарағанды университетінде ЭПР спектроскопия және кванттық химия мектебін құру және дамытудағы қосқан үлесі атап өтілген.

С.Н. Никольский, И.А. Пустолайкина

А.С. Масалимов — создатель и руководитель нового направления в ЭПР-спектроскопии и квантовой химии свободных радикалов

В статье освещен творческий путь выдающегося казахстанского ученого-химика А.С. Масалимова, который в 2022 г. отметит 70-летний юбилей. Представлены основные этапы его трудовой деятельности и значимые события научной карьеры. Показан вклад профессора А.С. Масалимова в создание и развитие школы ЭПР-спектроскопии и квантовой химии в Карагандинском университете имени академика Е.А. Букетова.

References

- 1 Masalimov, A.S., Prokofev, A.I., Bubnov, N.N., Solodovnikov, S.P., & Kabachnik, M.I. (1978). Proton-exchange and transfer-reactions involving 3,5-di-tert-butyl-6-chloro-2-hydroxyphenoxyl. *Bulletin of the Academy of Sciences of the USSR Division of Chemical Science*, 27(1), 210–213. <https://doi.org/10.1007/bf01153250>
- 2 Masalimov, A.S., Prokofev, A.I., Bubnov, N.N., Solodovnikov, S.P., & Kabachnik, M.I. (1977). ESR investigation of proton-transfer from 3,6-di-tert-butyl-2-hydroxyphenoxyl to primary and secondary-amines. *Bulletin of the Academy of Sciences of the USSR Division of Chemical Science*, 26(4), 696–700. <https://doi.org/10.1007/bf01108183>
- 3 Masalimov, A.S., Prokofiev, A.I., Bubnov, N.N., Solodovnikov, S.P., & Kabachnik, M.I. (1977). Nevyrozhdennaiia tautomeriia v svobodnykh radikalakh. Vnutrimolekuliarnaia migratsiia atoma vodoroda v 4,6-di-tret.butil-3-khlor-2-oksifenoksile [Non-degenerated tautomerism in free-radicals — intramolecular migration of hydrogen-atom in 2-chloro-6-oxy-3,5-di-tret-butylphenoxyl]. *Doklady Akademii Nauk SSSR — Reports of the USSR Academy of Sciences*, 236(1), 116–119 [in Russian].
- 4 Masalimov, A.S., Bazhikov, K.T., Melbardis, L.E., & Prokofev, A.I. (1994). ESR study of the effect of water on the kinetics of proton-transfer and exchange in solutions of semiquinone radicals. *Russian Chemical Bulletin*, 43(6), 953–956. <https://doi.org/10.1007/bf01558055>
- 5 Masalimov, A.S., Nikolskii, S.N., Dmitriev, P.I., Prokofev, A.I., & Muldakhmetov, Z.M. (1991). Kinetics of proton-transfer between semiquinone and nitroxyl radicals. *Bulletin of the Academy of Sciences of the USSR Division of Chemical Science*, 40(1), 53–57. <https://doi.org/10.1007/bf00959629>
- 6 Masalimov, A.S., Nikolskii, S.N., Prokofev, A.I., & Muldakhmetov, Z.M. (1992). ESR analysis of proton-transfer in viscous media. *Bulletin of the Russian Academy of Sciences Division of Chemical Science*, 41(9), 1563–1566. <https://doi.org/10.1007/bf00863573>
- 7 Masalimov, A.S., Nikolskii, S.P., Khodak, A.A., Prokofev, A.I., Muldakhmetov, Z.M., & Kostyanovkii, R.G. (1991). ESR study of protonation of substituted 3-member nitrogen-heterocycles. *Bulletin of the Academy of Sciences of the USSR Division of Chemical Science*, 40(1), 47–52. <https://doi.org/10.1007/bf00959628>
- 8 Masalimov, A.S., Nikolskiy, S.N., Kemalov, O.D., Prokofyev, A.I., & Muldakhmetov, Z.M. (1991). Tautomeriia v ionnykh parakh semikhinonnykh anion-radikalov s ammonievymi kationami [Tautometry in ionic pairs of semiquinone anion-radicals with ammonium cations]. *Teoreticheskaia i eksperimentalnaia khimiia — Theoretical and Experimental Chemistry*, 27(2), 184–188 [in Russian].
- 9 Masalimov, A.S., Tur, A.A., & Nikolskiy, S.N. (2016). Protolytic Reactions of 3,6-Di-tert-Butyl-2-Hydroxyphenoxyl with Nitrogen Bases. *Theoretical and Experimental Chemistry*, 52(1), 57–65. <https://doi.org/10.1007/s11237-016-9451-0>
- 10 Masalimov, A.S., Tur, A.A., Tuktybayeva, A.E., & Nikolskiy, S.N. (2015). Quantum-chemical investigations of the dual protolytic activity of several semiquinone radicals. *Bulletin of the University of Karaganda – Chemistry*, 77, 51–56.
- 11 Nikolskiy, S.N., Abilkanova, F.Z., Golovenko, A.S., Pustolaikina, I.A., & Masalimov, A.S. (2020). Investigation of intermolecular proton exchange of 3,6-di-tert-butyl-2-oxyphenoxyl with N-phenylanthranilic acid by ESR spectroscopy method. *Bulletin of the University of Karaganda – Chemistry*, 98, 35–41. <https://doi.org/10.31489/2020Ch2/35-41>
- 12 Nikolskiy, S.N., Tur, A.A., Yelchibekova, A.A., Kutzhanova, K.Z., & Masalimov, A.S. (2015). Investigation of intermolecular proton exchange 3,6-di-tert-butyl-2-hydroxyphenoxyl with phenol by ESR spectroscopy method. *Bulletin of the University of Karaganda – Chemistry*, 77, 47–50.
- 13 Masalimov, A.S. (1984) Kineticheskie aspekty teorii kislot i osnovanii M.I. Usanovicha [Kinetic aspects of the M.I. Usanovich theory of acids and bases]. *Issledovanie kislotno-osnovnogo vzaimodeistviia v dvoynykh i troinykh sistemakh: Sbornik nauchnykh trudov Kazakhskogo gosudarstvennogo universiteta imeni S.M. Kirova — Study of acid-base interactions in binary and ternary systems: Collection of scientific papers of S.M. Kirov Kazakh State University*, Alma-Ata, pp. 92–96 [in Russian].

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