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TO THE 80th ANNIVERSARY FROM THE BIRTH OF A.A. SAMOKHIN, DOCTOR OF PHYSICAL AND MATHEMATICAL SCIENCES, CHIEF RESEARCHER OF THE PROKHOROV GENERAL PHYSICS INSTITUTE OF THE RUSSIAN ACADEMY OF SCIENCES

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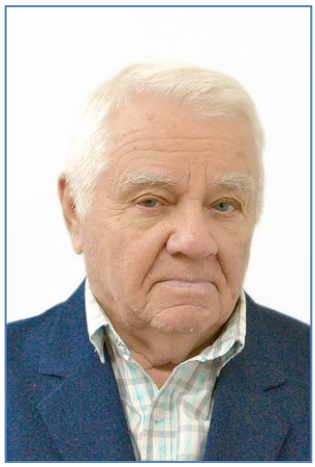
Summary. The article is dedicated to the 80th anniversary of the birth of the Soviet and Russian theoretical physicist, Doctor of Physical and Mathematical Sciences A.A. Samokhin, Chief Researcher of the Theoretical Department of the Institute of Prokhorov General Physics Institute of the RAS, a regular contributor to Mathematica Montisnigri and a long-term active participant in the international scientific seminar "Mathematical Models and Modeling in Laser-Plasma Processes and Advanced Scientific Technologies" (LPpM3), one of the founders of which is Mathematica Montisnigri.

11 december 2020 marks the 80th anniversary of the birth of Alexander Alexandrovich Samokhin, Doctor of Physics and Mathematics, Soviet and Russian physicist. Samokhin's scientific life is associated with the P.N. Lebedev Physical Institute of the RAS (FIAN), and later with the Prokhorov General Physics Institute of the RAS (GPI RAS), where he still works as the chief researcher of the theoretical department. "Physicist from God" - such a description was given to A.A. Samokhin in the book [1] “Events and People. (1948-2010)" written by an outstanding scientist in the field of plasma physics, twice laureate of the USSR State Prizes, laureate of the M.V. Lomonosov Moscow State University, Doctor of Physical and Mathematical Sciences, Professor Anri Amvrosyevich Rukhadze, with whom A.A. Samokhin had long-term cooperation. Aleksandr Aleksandrovich is a regular contributor to Mathematica Montisnigri and a long-term active participant in the international scientific seminar "Mathematical Models and Modeling in Laser-Plasma Processes and Advanced Scientific Technologies" (LPpM3, Montenegro), one of the founders of which is Mathematica Montisnigri. An active life position has led to the combination of scientific work with public discussion of scientific community problems. A. Samokhin is the chairman of the trade union



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of the Institute, a long-term member of the All-Russian Trade Union of RAS Workers, and also one of the organizers of the "Society of Scientists", created in 2012.

Alexander Alexandrovich was born in Rostov-on-Don and graduated from school there in 1957. He spent several war years outside the place of his birth, finding himself with his mother in the occupation near Kotelnikovo, known from the history of the Battle of Stalingrad.

The rapid development and widespread popularization of science in the USSR, characteristic of the post-war period (after the victory in the war with Nazi Germany in 1945), led A.A. Samokhin to the Faculty of Physics of M.V. Lomonosov Moscow State University, after which he entered the postgraduate course of the N.N. Semenov Institute of Chemical Physic of the AS of USSR. In his postgraduate studies, he is engaged in various approaches to the theoretical description of the response of a concentrated paramagnetic spin system in solids to an alternating magnetic field, showing additional interest in general problems of the nonequilibrium behavior of macroscopic systems. His first works [2-4] attracted the attention of the staff of the team headed by the famous scientist I. Prigozhin. The end of the postgraduate study in 1966 coincided with the time of the "Prokhorov recruitment" of young employees at the P.N. Lebedev Physical Institute of the RAS (FIAN), including A.A. Samokhin. Soon after, Samokhin defended his Ph.D. thesis on the theory of nonlinear response of a spin system in solids. Several years after defending his Ph.D. thesis, A.A. Samokhin. continued to actively deal with general issues of nonequilibrium statistical mechanics, returning to them later as well [5-7].

At the same time, he began to study new issues in the theory of the interaction of intense electromagnetic radiation with atoms, molecules and condensed media. During this study the circle of coauthors also expanded, including colleagues from the Moscow Engineering Physics Institute (MEPhI), M.V. Lomonosov Moscow State University, Baikov Institute of Metallurgy and Materials Science of the RAS (IMET) and other organizations.

The results of the work of A.A. Samokhin on the effect of laser radiation on individual quantum systems were published, in particular, in [8-10] and other articles, while his studies of the interaction of radiation with condensed media began with the question of the instability of the irradiated surface of a transparent liquid due to the ponderomotive effect [11]. Further theoretical and experimental studies, concerning, in the main, the effect of radiation on absorbing condensed media, are fairly fully reflected (until the mid-1980s) in three large articles from Proceedings of the Institute of General Physics Academy of Sciences of the USSR [12-14]. Articles [12,13] are actually material for A.A. Samokhin doctoral dissertation, which was defended in 2000.

In [12, 14], in particular, the efficiency of studying laser-induced fast phase transformations by registering the acoustic disturbances arising in this case was demonstrated and, using a model example [15], it was shown how the solution of the evaporation Stefan problem can change when taking into account the dependence of the state of the irradiated liquid on pressure.

In the same period, A.A. Samokhin started the fruitful scientific cooperation with the students of the outstanding Soviet and Russian mathematician, academician of the Academy of Sciences of USSR and the Russian Academy of Sciences, the founder of the Soviet and Russian schools of mathematical modeling, A.A. Samarsky from the Keldysh Institute of Applied Mathematics of the RAS. The publications of the first decades of this collaboration, in which the continuum and model-kinetic approaches were used, dealt with various

nonequilibrium effects in laser ablation and were partially reflected in [16-22]. In subsequent theoretical works, in addition to the methods mentioned above, the molecular dynamic modeling was also used [23-32].

The results of these works, as well as of the other studies [33–37], made it possible to formulate a number of important conclusions on nonequilibrium laser ablation processes, among which one can single out the first formulated fundamental physical problem of determining the equilibrium physical characteristics of a substance, in particular, the parameters of its critical point, by the results of experiments in nonequilibrium conditions. Attention is drawn to the groundlessness of the widely used extension of the results of describing the decay of a metastable liquid at low overheating to the near-spinodal region, where the emerging nuclei of a new phase can no longer be considered independent. Under conditions of laser ablation, an important role is also played by the spatial inhomogeneity of temperature, which significantly affects the dynamics of the decay of a highly superheated metastable liquid, and possible abrupt changes in the electromagnetic properties of a substance such as a metal-insulator transition. When modeling the gas-dynamic boundary conditions at the evaporation front, the influence of the features of their dependence on the Mach number on the problem of the morphological stability of the evaporation front was established.

In addition to work on the main direction of his activity, AA Samokhin also paid attention to other issues, in particular, related to the manifestations of misunderstandings and misconduct in science, which are discussed in [1,9,12,13, 38-40].

We wish Alexander Alexandrovich Samokhin good health, long and fruitful scientific and social activities.

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К 80-ЛЕТИЮ СО ДНЯ РОЖДЕНИЯ ДОКТОРА ФИЗИКО-МАТЕМАТИЧЕСКИХ НАУК, ГЛАВНОГО НАУЧНОГО СОТРУДНИКА ИНСТИТУТА ОБЩЕЙ ФИЗИКИ ИМ. А.М. ПРОХОРОВА РАН А.А. САМОХИНА

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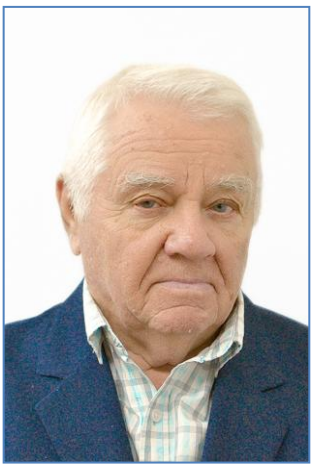
Ключевые слова: задача Стефана, фазовые превращения, лазерная абляция, критические параметры, оптоакустика, математическое моделирование.

Аннотация. Статья посвящена 80-летию со дня рождения советского и российского физика-теоретика, доктора физико-математических наук А.А. Самохина, главного научного сотрудника теоретического отдела Института общей физики им. А.М. Прохорова РАН, постоянного автора журнала Mathematica Montisnigri и многолетнего активного участника международного научного семинара «Математические модели и моделирование в лазерно-плазменных процессах и передовых научных технологиях» (LPpM3), одним из учредителей которого является журнал Mathematica Montisnigri.



11 декабря 2020 года исполнилось 80 лет со дня рождения Александра Александровича Самохина, доктора физико-математических наук, советского и российского физика. Научная жизнь Самохина связана с Физическим институтом им. П.Н. Лебедева АН СССР (ФИАН), а впоследствии и с Институтом общей физики им. А.М. Прохорова РАН (ИОФ РАН), в котором он и по сей день трудится в качестве главного научного сотрудника теоретического отдела. «Физик от бога» - такую характеристику дал А.А. Самохину в своей книге [1] «События и люди. (1948-2010 годы)» выдающийся ученый в области физики плазмы, дважды лауреат Государственных премий СССР, лауреат премии имени М.В. Ломоносова МГУ, доктор физико-математических наук, профессор Анри Амвросьевич Рухадзе, с которым А.А.Самохина связывало

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долговременное сотрудничество. Александр Александрович является постоянным автором журнала Mathematica Montisnigri и многолетним активным участником международного научного семинара «Математические модели и моделирование в лазерно-плазменных процессах и передовых научных технологиях» (LPpM3, Черногория), одним из учредителей которого является журнал Mathematica Montisnigri. Активная жизненная позиция привела к совмещению научной работы с общественной. Самохин А.А является председателем профсоюзной организации Института, многолетним членом Всероссийского профсоюза работников РАН, а также одним из организаторов «Общества научных работников», созданного в 2012 году.

Родился Александр Александрович в Ростове-на-Дону и там же окончил школу в 1957 г. Несколько военных лет он провел вне места своего рождения, оказавшись вместе с матерью в оккупации близ Котельниково, известного по истории Сталинградской битвы.

Бурное развитие и широкая популяризация науки в СССР, характерная для послевоенного времени (после победы в войне с фашистской Германией в 1945 году), привели А.А. Самохина на физический факультет МГУ им. М.В. Ломоносова, после окончания которого, он поступает в аспирантуру Института химической физики им. Н.Н. Семенова АН СССР. В аспирантуре занимается различными подходами к теоретическому описанию отклика концентрированной парамагнитной спиновой системы твердого тела на переменное магнитное поле, проявляя дополнительный интерес к общим проблемам неравновесного поведения макроскопических систем. Его первые работы [2-4], привлекли внимание сотрудников коллектива, руководимого известным ученым И. Пригожиным. Окончание аспирантуры в 1966 г. совпало со временем очередного «Прохоровского набора» молодых сотрудников в Физический институт им. П.Н. Лебедева Академии Наук СССР, в числе которых оказался и Самохин А.А. Вскоре после этого Самохин защитил кандидатскую диссертацию по теории нелинейного отклика спиновой системы твердого тела. Несколько лет после защиты кандидатской диссертации Самохин А.А. продолжал активно заниматься общими вопросами неравновесной статистической механики, возвращаясь к ним и в более поздние времена [5-7].

В это же время он приступил к исследованию новых вопросов теории взаимодействия интенсивного электромагнитного излучения с атомами, молекулами и конденсированными средами. При этом расширялся и круг соавторов, в число которых входили также коллеги из Московского инженерно-физического института (МИФИ), МГУ им. М.В. Ломоносова, Института металлургии им. А.А. Байкова АН СССР (ИМЕТ) и других организаций.

Результаты работ Самохина А.А. по воздействию лазерного излучения на отдельные квантовые системы публиковались, частности, в [8-10] и других статьях, а его исследования взаимодействия излучения с конденсированными средами начались с вопроса о неустойчивости облучаемой поверхности прозрачной жидкости за счет пондеромоторного эффекта [11]. Дальнейшие теоретические и экспериментальные исследования, касающиеся, в основном, воздействия излучения на поглощающие конденсированные среды, достаточно полно отражены (до середины 80-х годов) в трех больших статьях сборника Труды ИОФАН [12-14]. Статьи [12,13] представляют собой фактически материал докторской диссертации, защита которой состоялась в 2000г.

В работах [12,14] была, в частности, продемонстрирована эффективность исследования лазерно-индуцированных быстрых фазовых превращений путем регистрации возникающих при этом акустических возмущений и на модельном примере [15] показано, как может изменяться решение испарительной задачи Стефана при учете зависимости состояния облучаемой жидкости от давления.

В тот же период началось, продолжающееся до настоящего времени, плодотворное научное сотрудничество А.А. Самохина с учениками выдающегося советского и российского математика, академика Академии Наук СССР и Российской Академии Наук, основоположника советской и российской школы математического моделирования, А.А. Самарского из Института прикладной математики им. М.В. Келдыша РАН. Публикации первых десятилетий этого сотрудничества, в которых использовались континуальные и модельно-кинетические подходы, касались различных неравновесных эффектов при лазерной абляции и частично отражены в [16-22]. В последующих теоретических работах в качестве основного подхода, кроме уже упомянутого выше, использовался метод молекулярно-динамического моделирования [23-32].

Результаты этих работ, а также других исследований [33-37], позволили сформулировать ряд важных выводов по неравновесным процессам лазерной абляции, в числе которых можно выделить впервые сформулированную фундаментальную физическую проблему определения равновесных физических характеристик вещества, в частности, параметров его критической точки, по результатам экспериментов в неравновесных условиях. Обращено внимание на необоснованность широко используемого распространения результатов описания распада метастабильной жидкости при малых перегревах на околоспинодальную область, где возникающие зародыши новой фазы уже нельзя считать независимыми. В условиях лазерной абляции важную роль играет также пространственная неоднородность температуры, существенно влияющая на динамику распада сильно перегретой метастабильной жидкости, и возможные резкие изменения электромагнитных свойств вещества типа перехода металл-диэлектрик. При моделировании газодинамических граничных условий на фронте испарения было установлено влияние особенностей их зависимости от числа Маха на проблему морфологической устойчивости испарительного фронта.

Кроме работ по основному направлению своей деятельности, А.А.Самохин уделял также внимания и другим вопросам, в частности, связанным с проявлениями недоразумений и недобросовестности в науке, которые обсуждаются в [1,9,12,13, 38-40].

Пожелаем Александру Александровичу Самохину крепкого здоровья, долгой и плодотворной научной и общественной деятельности.

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