

Alexander Bulgakov, Prof., Dr. Sci.

(updated Feb. 20, 2023)

Address: HiLASE Centre, Institute of Physics ASCR, Za Radnicí 828,
25241 Dolní Břežany, Czech Republic

Email: bulgakov@fzu.cz
alexander.bulgakov@hilase.cz

Web: <https://www.fzu.cz/en/people/prof-alexander-v-bulgakov-drsc>
<https://www.researchgate.net/profile/Alexander-Bulgakov-2>
<https://orcid.org/0000-0002-9651-1328>



PROFESSIONAL INTERESTS / RESEARCH EXPERTISE

Interaction of laser radiation with matter; dynamics of laser ablation plasma plumes; laser-induced forward transfer of delicate nanosystems and biomolecules; cluster and nanostructure formation under laser ablation and supersonic gas expansion; dynamics of laser-excited systems; nanoparticle detection; mass spectrometry and electron spectroscopy. Principle investigator; leader of a research team.

EDUCATION

- | | |
|----------------|--|
| November, 2004 | Dr.Sci. in Physics and Mathematics (Habilitation), Kutateladze Inst. of Thermophysics SB RAS, Novosibirsk, Russia. Dr.Sci. Thesis “Dynamics and mechanisms of cluster formation under pulsed laser ablation” |
| January, 1987 | Ph.D. in Physics and Mathematics, Kutateladze Inst. of Thermophysics SB RAS, Novosibirsk. PhD Thesis “Gas dynamic separation of gas mixtures and isotopes in interacting flows” |
| February, 1979 | MSc in Applied Physics (1st Class Honors), Ural Polytechnical Institute, Phys.-Techn. Dept, Sverdlovsk, Russia |

PROFESSIONAL EXPERIENCE

- | | |
|----------------|---|
| 2017 - present | Senior researcher , Head of group Nanomaterials, HiLASE Centre, Institute of Physics ASCR, Dolní Břežany, Czech Republic |
| 1979 – 2020 | PhD student, Junior Researcher, Senior Researcher, and Principal Researcher , Kutateladze Institute of Thermophysics SB RAS, Novosibirsk, Russia |
| 2012-2014 | Visiting Professor (Marie Curie Fellowship of FP7 EC), University of Edinburgh, School of Chemistry. UK |
| 2010 | Guest professor , Institute of Chemical Physics “Rocasolano”, CSIC, Madrid, Spain (1 month) |
| 2000 – 2004 | Guest scientist , Université de la Méditerranée, Centre Interdisciplinaire de Nanoscience de Marseille (CINaM), Marseille, France (22 months) |
| 1999 – 2009 | Guest scientist , Gothenburg University, Atomic Physics Group, Gothenburg, Sweden (28 months) |

PUBLICATION ACTIVITIES

h-index of 22 Scopus, as of February 2023

Authored 1 book and 6 book chapters, >90 peer reviewed journal papers which received >2000 citations

Selected 5 most important recent papers:

- 1 V.A. Volodin, Yuzhu Cheng, **A.V. Bulgakov**, Y. Levy, J. Beránek, S. Nagisetty, M. Zukerstein, A.A. Popov, N.M. Bulgakova, Single-shot selective femtosecond and picosecond infrared laser crystallization of an amorphous Ge/Si multilayer stack, *Opt. Laser Technol.* **161** (2023) 109161.
- 2 **A.V. Bulgakov**, N.M. Bulgakova, Recent advances in nanoparticle generation in liquids by lasers: Revealing formation mechanisms and tailoring properties, *Sci. China-Phys. Mech. Astron.* **65** (2022) 274207.
- 3 S.V. Starinskiy, A.A. Rodionov, Y.G. Shukhov, A.I. Safonov, E.A. Maximovskiy, V.S. Sulyaeva, **A.V. Bulgakov**, Formation of periodic superhydrophilic microstructures by infrared nanosecond laser processing of single-crystal silicon, *Appl. Surf. Sci.* **512**, (2020) 145753.
- 4 **A.V. Bulgakov**, I. Mirza, N.M. Bulgakova, V.P. Zhukov, R. Machulka, O. Haderka, E.E.B. Campbell, T. Mocek, Initiation of air ionization by ultrashort laser pulses: evidence for a role of metastable-state air molecules, *J. Phys. D: Appl. Phys.* **51** (2018) 25LT02.
- 5 N.T. Goodfriend, S.Y. Heng, O.A. Nerushev, A.V. Gromov, **A.V. Bulgakov**, M. Okada, W. Hu, R. Kitaura, J. Warner, H. Shinohara, E.E.B. Campbell, Blister-based-laser-induced-forward-transfer: a non-contact, dry laser-based transfer method for nanomaterials, *Nanotechnology* **29** (2018) 385301.

APPLICATION RESULTS

- 1 N.T. Goodfriend, **A.V. Bulgakov**, A method and a device for assembly of a nanomaterial structure, Patent LU102294, Patent applications EP4015135, US2022194111, 2022.

RESEARCH GRANTS

Since 2016 acquired more than 7.5 million Euro on research grants:

		International
2022 - 2025	GAČR-DFG, Synthesis of high-entropy alloy nanoparticles by laser ablation in liquids: scalability and monodispersity control by beam shaping. Bilateral: Czech – Germany (coPI, 50 k€).	Yes
2017 – 2023	OP VVV program of the Ministry of Education, Youth and Sports, Czech Republic, Advanced designing of functional materials: From mono- to BI- and TRI-chromatic excitation with tailored laser pulses” (BIATRI), (KI, 7.2 M€)	
2019 – 2022	Russian Foundation for Basic Research (RFBR), Dynamic changes in optical properties of one- and two-component materials upon action of short and ultrashort laser pulses (PI, 30 k€).	
2018 – 2020	RFBR, Formation, dynamics and role of the cavitation vapor bubble under laser ablation in liquids (PI, 40 k€).	
2016 - 2018	Russian Science Foundation, Synthesis of new functional materials for plasmonics, catalysis and solar cell engineering: synergetic effect of laser ablation and gas jet deposition (PI, 320 k€).	
2016 - 2017	RFBR, Formation of multicomponent nanostructures in the gas phase and on surfaces by pulsed laser ablation (PI, 40 k€).	

INVITED TALKS AT INTERNATIONAL CONFERENCES

Regular seminars at universities and research institutions and invited talks at international conferences (list since 2017):

- 1 **A.V. Bulgakov**, Dual wavelength femtosecond laser-induced damage and ablation of silicon, FemtoMat international conference, Mauterndorf, Austria, March 14-16, 2022.
- 2 **A.V. Bulgakov**, Dual wavelength ultrashort laser ablation and surface modification of silicon, 5th Int. Conf. Ultrafast Optical Science, UFL-2021, Moscow, Russia, Oct. 4-8, 2021.

- 3 **A.V. Bulgakov**, M. Stehlik, I. Mirza, N.M. Bulgakova Single-shot and multi-shot damage of metals and semiconductors induced by ultrashort laser pulses: Comparison of air and water environments, 4th Int. Conf. on Ultrafast Optical Science, UltrafastLight-2020, Moscow, Russia, Sept. 28 – Oct. 2, 2020.
- 4 **A.V. Bulgakov**, S.V. Starinskiy, M. Stehlik, I. Mirza, Y.G. Shukhov, C. Liberatore, N.M. Bulgakova, Damage effects in metals induced by short and ultrashort laser pulses: Comparison of air and water environments, 27th Int. Conf. on Advanced Laser Technologies (ALT'19), Prague, Czech Republic, Sept. 16-20, 2019.
- 5 **A.V. Bulgakov**, Observation of repetition-rate dependent ionization of air by ultrashort laser pulses: Evidence for a role of metastable states of air molecules, Int. Conf. FemtoMat, Mauterndorf, Austria, March 18-22, 2019.
- 6 **A.V. Bulgakov**, Light scattering dynamics during pulsed laser irradiation of metals in water: Effects on laser-induced damage thresholds, Int. Symp. on High Power Laser Ablation (HPLA-2018). Santa Fe, NM, USA, March 26-29, 2018.
- 7 **A.V. Bulgakov**, Temperature effects in synthesis of nanostructured films by pulsed laser deposition: Comparison of substrate heating and post-annealing, 11th Int. Conf. on Surface Materials and Vacuum, Playa del Carmen, Mexico, Sept. 24-28, 2018.
- 8 **A.V. Bulgakov**, N.M. Bulgakova, W. Marine, Acceleration of ions emitted from ultrashort-laser-irradiated surfaces in the photoelectron-induced electric field, , Int. Conf. FemtoMat, Mauterndorf, Austria, March 27-29, 2017.
- 9 **A.V. Bulgakov**, Laser-induced damage thresholds of metals: Comparison of air and water environments, 25th Int. Conf. on Advanced Laser Technologies (ALT-2017), Busan, Korea, Sept. 10-15, 2017.

AWARDS and FELLOWSHIPS

2012 – 2014	Marie Curie Fellowship for Experienced Researchers of the European Commission
2009	Research Professorship “Femtosecond ionization of atoms” from Gothenburg University, Sweden
1993	International Science Foundation Award

TEACHING ACTIVITIES AND SUPERVISION OF STUDENTS

2021	Lectures “Nanomaterial production by lasers” at Hanyang University, Seoul, Korea (online)
2020	Lectures “Nanomaterial production by lasers” at Olomouc University, Czech Republic
2002 – 2016	Lectures “Modern Problems of Thermophysics in Applications to Nanotechnologies”, Novosibirsk State University, Russia
1993 – present	Supervision of diploma students (6 MS theses completed) and PhD students (4 theses completed) of Novosibirsk State University, Novosibirsk State Technical University, Russian Academy of Science, Gothenburg University and University of Edinburgh

COMMISSIONS OF TRUST AND SERVING SCIENTIFIC COMMUNITY

2020 – present	Member of the Steering Committee of Conferences on Laser Ablation (COLA)
2020 – present	Member of the editorial Board of Interfacial Phenomena and Heat Transfer
2019	Member of the Organizing Committee of Advanced Laser Technologies (ALT19) conference
2002 – present	Reviewer of refereed journals including Phys. Rev (Lett., B, E), J. Phys. Chem., Appl. Phys. A, Appl. Surf. Sci., Thin Solid Films, Opt. Las. Eng., J. Cluster Sci.
2016 – present	Reviewer of the Russian Science Foundation
2017 – 2021	Project evaluation for the Russian Academy of Science