	ZYUZIN, Mikhail V. Doctor of Physics and Mathematics
Research interests	✓ Functional composite materials ✓ Intracellular substance ✓ Nonlinear ✓ Sensorics ✓ Anti-counterfeiting labels
Features of the PhD program	The postgraduate program lasts four years. During this time, a student must publish at least three articles (Scopus/WoS, Q1-Q2), participate in three international conferences, and complete four courses.
List of the supervisor's research projects (participation/supervision)	✓ Hybrid micro- and nanocarriers as a universal platform for controlled, photo-mediated drug release, Principal Investigator (Russian Science Foundation Grant No. 19-75-00039) ✓ Development of a combined method for treating breast cancer using targeted radionuclide therapy combined with immunotherapy, Principal Investigator (Russian Science Foundation Grant No. 21-75-10044) ✓ Development of a method for treating breast cancer through chemically initiated drug release from hybrid redox-sensitive carriers, Principal Investigator (Russian Science Foundation Grant No. 24-75-10006) ✓ Nanophotonic devices for optical detection, Key Researcher (Russian Science Foundation Grant No. 21-72-30018)
List of potential thesis topics	✓ Laser-induced micro- and nanostructures for applied applications (sensing, security tags, nanophotonics, etc) ✓ Investigation of nonlinear properties in metal-semiconductor micro- and nanostructures
Publications in the last five years	78 (Scopus / Web of Science / RSCI)
Key publications	1. L. Mikhailova, E. Vysotina, M. Timofeeva, E. Kopoleva, V. Gulinyan, O. Pashina, K. Arabuli, O. Gusliakova, E. Prikhozhdenko, X. Qi, A. Petrov, E. Ageev, M. Petrov, C. De Angelis, M. Durymanov, G. Sukhorukov, M. V. Zyuzin, A comparative study of plasmonic nanoparticles for targeted photothermal therapy of melanoma tumors using various irradiation modes, Light: Advanced Manufacturing 2025, 6(1), 24-42, DOI: 10.37188/lam.2025.005, https://www.light-am.com/en/article/doi/10.37188/lam.2025.005, [IF=8.85], Q1 (2024) 2. A. Kuleshova, I. Koriakina, A. Lubimova, M. Timofeeva, E. Gunina, K. Bogdanov, I. Reznik, S. A. Povarov, S. Khubezhov, D. Guzei, A. Minakov, K. Toda-Peters, A. Q Shen, V. Milichko, M. V. Zyuzin, Continuous fabrication of MOF-based memory elements via droplet microfluidic synthesis, Journal of Materials

	Chemistry A 2024, 12, 29776-29784, DOI: 10.1039/D4TA03126A, https://pubs.rsc.org/en/content/articlelanding/2024/ta/d4ta03126a, [IF=10.7], Q1 (2024) 3. E. Kopoleva, M. D. Lebedev, A. Postovalova, A. Rogova, L. Fatkhutdinova, O. Epifanovskaya, A. A. Goncharenko, A. V. Kremleva, N. Domracheva, A. S. Bukatin, A. R. Muslimov, A. Koroleva, E. V. Zhizhin, K. V. Lepik, A. S. Timin, O. Peltek, M. V. Zyuzin, One-Pot Synthesis of Affordable Redox-Responsive Drug Delivery System Based on Trithiocyanuric Acid Nanoparticles, Nano Lett. 2023, 23, 10811-10820, DOI: 10.1021/acs.nanolett.3c02933, https://pubs.acs.org/doi/10.1021/acs.nanolett.3c02933, [IF=10.800], Q1 (2024) 4. O. O. Peltek, T. E. Karpov, A. Rogova, A. Postovalova, E. Ageev, A. Petrov, D. Antuganov, A. A. Stanzhevsky, D. N. Maistrenko, D. Zuev, A. R. Muslimov, A. S. Timin, M. V. Zyuzin, Development of Nanocarrier-Based Radionuclide and Photothermal Therapy in Combination with Chemotherapy in Melanoma Cancer Treatment, ACS Appl. Mater. Interfaces 2023, 15, 13460−13471. DOI: 10.1021/acsami.2c20619, https://pubs.acs.org/doi/10.1021/acsami.2c20619, [IF=9.5], Q1 (2024) 5. I. G. Koryakina, S. V. Bachinin, E. N. Gerasimova, M. V. Timofeeva, S. A. Shipilovskikh, A. S. Bukatin, A. Sakhatskii, A. S. Timin, V. A. Milichko, M. V. Zyuzin, Microfluidic synthesis of metal-organic framework crystals with surface defects for enhanced molecular loading, Chem. Eng. J. 2023, 452, 139450. DOI: 10.1016/j.cej.2022.139450, https://www.sciencedirect.com/science/article/pii/S1385894722049294, [IF=15.1], Q1 (2024)
Key IPs	✓ Targeted photothermal therapy for melanoma using plasmonic nanoparticles has been systematically investigated. [Light: Advanced Manufacturing 2025, 6, 1, 24-42] ✓ Methods for thermometry inside biological objects using light-sensitive nanomaterials have been developed. [Nanophotonics 2024, 13, 22, 4111–4125]; [ACS Appl. Nano Mater. 2023, 6, 20, 18848–18857] ✓ A new method has been developed for the synthesis of redox-sensitive nanoparticles based on trithiocyanuric acid, as well as their loading with bioactive compounds. [Nano Lett. 2023, 23, 10811-10820] ✓ A universal method for loading diagnostic and therapeutic radionuclides into nano- and microparticles of calcium carbonate was developed. It was shown that the developed carriers can retain 225Ac and its daughter radioisotopes inside the carrier for 30 days. [J. Controlled Release 2021, 330, 726-737]; [ACS Appl. Mater. Interfaces 2020, 12, 31137−31147] ✓ A technology has been developed for the delivery of bioactive substances to cells using polymer particles and stem cells, and the remote release of these substances in cells using IR

	radiation has been carried out. The temperature of destruction of particles when they were irradiated with IR radiation was measured. [Chem. Eur. J., 2018, 24, 2098-2102]; [Biomater. Sci., 2020, 8, 1137]; [Laser Photonics Rev. 2020, 1900082]; [ACS Appl.Mater.Interfaces 2018, 10.34849−34868]
Supervisor's specific requirements	✓ English language — upper-intermediate ✓ Knowledge in the following areas (not all required, depends on the project): Electrodynamics, Organic and inorganic chemistry, Fundamentals of hydrodynamics, Numerical modeling (electrodynamic problems, hydrodynamics, laser heating), Fundamentals of laser technology, Experimental research methods (optical, chemical)
Code of the subject area of the PhD program	1.3.2 Devices and Methods of Experimental Physics 1.3.6 Optics 1.3.8 Condensed State Physics 2.2.7 Photonics