	ORLOVA, Anna O. Dr. Sci., Physics and Mathematics (ITMO University)
Research interests	Fundamental research in the field of development of colloidal systems and multilayer coatings based on colloidal quantum-sized semiconductor 0D, 1D and 2D nanocrystals; magnetic nanoparticles; metal oxides; molecular generators of reactive oxygen species (ROS); specific indicator molecules; porous dielectric matrices
Features of the PhD program	International scientific collaboration. Among the international partners are the School of Chemistry and the School of Medicine at Trinity College, Dublin; the Chemistry Laboratory of the Lyon School of Higher Education, France; Ben-Gurion University of the Negev, Israel; Center for Nano & Material Sciences at Jaina University, India; Cente of Semiconductor Components and Nanotechnologies at Compinas University, Brazil. The research team of Professor Orlova uses unique equipment, including: 1. Scanning electron microscope – Merlin (Carl Zeiss, Germany). 2. Laser scanning luminescence microscope with the option of measuring the luminescence decay time – MicroTime100 (Pico Quant, Germany). 3. Confocal laser scanning fluorescent microscope – LSM-710 (Carl Zeiss, Germany). 4. Micro-Raman Spectrometer – «inVia» (Renishaw, UK). 5. FTIR spectrometer – Tensor 27 (Bruker, Germany). 6. Atomic force microscope – Solver-PRO (NT-MTD, Russia). 7. Scanning spectrophotometer – UV-3600 (Shimadzu, Japan). 8. Scanning spectrofluorometer – Cary Eclipse (Varian, USA). 9. CD spectrometer with MCD accessories – JASCO. 10. Source Measure Unit Instruments Keithley 2400(Tektronix, USA). 13. A chemical laboratory with the necessary equipment and chemical reagents for the synthesis of colloidal nanoparticles, modification of their surface, and formation of the investigated hybrid structures. 14. Langmuir-Blodgett setup KN 2002 (KSV NIMA) The research of Professor Orlova's students was supported within the framework of the "Erasmus +", "Erasmus + Fund" programs, by a grant named after Maria Sklodowska-Curie, the Micro Fellowship program at ITMO University. 4 out of 5 postgraduate students defended ahead of schedule. Undergraduates and postgraduate students were supported by scholarships from the President of the Russian Federation, the government of St. Petersburg

List of the supervisor's research projects (participation/supervision)	✓ Photoactivatable nanocomposite systems for MRI- guided minimally invasive glioblastoma therapy. 2023-2026 (ITMO-Skoltech-MIPT joint project, PI at ITMO University) ✓ Luminescent quantum dot nanocomposites for therapy and diagnostics (Ministry of Science and Higher Education of the Russian Federation), 01.01.2020-31.12.2024 (PI) ✓ Ultrafast time-resolved adaptive digital holography in linear and nonlinear optical processes for dynamic biomedical imaging and diagnosis (Grants from the Russian Foundation for Basic Research), 2019-2021 (co-PI) ✓ Optical and electrical properties of hybrid nanomaterials based on carbon, semiconductor, and metallic nanostructures (Ministry of Science and Higher Education of the Russian Federation), 2013-2019 (researcher) ✓ Development of new systems of chiral quantum dots and their applications. (Ministry of Science and Higher Education of the Russian Federation), 2013-2017 (researcher)
List of potential thesis topics	✓ R&D of ROS nanogenerators based on molecular and nanoparticle sensitizers ✓ R&D of biocompatible magneto-luminescent nanostructures for target theranostics ✓ R&D of hybrid nanostructures for sensorics
Publications in the last five years	55 (Scopus / Web of Science / RSCI)
Key publications	1. T. O. Oskolkova, A. A. Matiushkina, L. N. Borodina, E. S. Smirnova, A. I. Dadadzhanova, F. A. Sewid, A. V. Veniaminov, E. O. Moiseeva, A. O. Orlova. FRET-Amplified Singlet Oxygen Generation by Nanocomposites Comprising Ternary AgInS2/ZnS Quantum Dots and Molecular Photosensitizers. https://doi.org/10.48550/arXiv.2309.09834 2. Belashov A.V., Shevkunov I.A., Kolesova E., Orlova A.O., Putilin S.E., Veniaminov A.V., Cheng C., Petrov N.V. Investigation of Nonlinear Optical Properties of Quantum Dots Deposited onto a Sample Glass Using Time-Resolved Inline Digital Holography//Journal of Imaging, 2022, Vol. 8, No. 3, pp. 74 3. Matiushkina A., Litvinov I., Bazhenova A., Belyaeva T.N., Dubavik A., Veniaminov A., Maslov V., Kornilova E., Orlova A. Time-and Spectrally-Resolved Photoluminescence Study of Alloyed CdxZn1-xSeyS1-y/ZnS Quantum Dots and Their Nanocomposites with SPIONs in Living Cells//International Journal of Molecular Sciences, 2022, Vol. 23, No. 7, pp. 4061 4. Stepanova M., Dubavik A., Efimova A., Konovalova M., Svirshchevskaya E., Zakharov V., Orlova A. Magneto-Luminescent Nanocomposites Based on Carbon Dots and Ferrite with Potential for Bioapplication//Nanomaterials, 2022, Vol. 12, No. 9, pp. 1396 5. Stepanova M.S., Gromova Y.A., Dubavik A.Y., Maslov V.G., Orlova A.O., Zakharov V.V. Carbon Dot Films with Efficient

	Interdot Forster Resonance Energy Transfer for Optical Coding by Ultraviolet Photooxidation//Journal of Physical Chemistry C, 2022, Vol. 126, No. 25, pp. 10441–10448
Key IPs	✓ It has been proposed a model of photoinduced electron transfer in hybrid structures based on CdSe quantum dots and titanium dioxide ✓ A model of energy transfer in structures with quantum dots, photosensitizers, and indicator molecules has been proposed ✓ The regularities of energy / charge transfer in hybrid structures based on multilayer graphene nanoribbons and quantum-sized nanocrystals have been established ✓ The regularities of the optical activity of semiconductor quantum nanocrystals, induced by chiral enantiomers have been established
Supervisor's specific requirements	A graduate student must have knowledge in the following areas: ✓ molecular spectroscopy ✓ solid state physics A postgraduate student must have experimental skills in spectroscopy including standard instrumentation (spectrophotometers, spectrofluorometer, DLS, Raman, FTIR) In addition, postgraduate student must have at least two of the following skills: ✓ ability to work with modern laser microscopes ✓ experience in experimental work devoted to optical properties of molecular objects or colloidal nanoparticles ✓ experience in the preparation of various layered samples and coatings based on molecules or colloidal nanoparticles using the Langmuir-Blodgett technique, spin coating, deep coating ✓ ability to write articles in English (availability of publications with first authorship) ✓ proficiency in Origin, Wolfram Mathematica, Python etc.
Code of the subject area of the PhD program	1.3.6 Optics 2.2.7 Photonics