

	<p>ORLOVA, Anna O. Dr. Sci., Physics and Mathematics (ITMO University)</p>
<p>Research interests</p>	<p>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</p>
<p>Features of the PhD program</p>	<p>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 &amp; Material Sciences at Jaina University, India; Cente of Semiconductor Components and Nanotechnologies at Compinas University, Brazil.</p> <p>The research team of Professor Orlova uses unique equipment, including:</p> <ol style="list-style-type: none"> <li>1. Scanning electron microscope – Merlin (Carl Zeiss, Germany).</li> <li>2. Laser scanning luminescence microscope with the option of measuring the luminescence decay time – MicroTime100 (Pico Quant, Germany).</li> <li>3. Confocal laser scanning fluorescent microscope – LSM-710 (Carl Zeiss, Germany).</li> <li>4. Micro-Raman Spectrometer – «inVia» (Renishaw, UK).</li> <li>5. FTIR spectrometer – Tensor 27 (Bruker, Germany).</li> <li>6. Atomic force microscope – Solver-PRO (NT-MTD, Russia).</li> <li>7. Scanning spectrophotometer – UV-3600 (Shimadzu, Japan).</li> <li>8. Scanning spectrofluorometer – Cary Eclipse (Varian, USA).</li> <li>9. CD spectrometer with MCD accessories – JASCO.</li> <li>10. Source Measure Unit Instruments Keithley 2400(Tektronix, USA).</li> <li>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.</li> <li>14. Langmuir-Blodgett setup KN 2002 (KSV NIMA)</li> </ol> <p>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</p>

List of the supervisor's research projects (participation/supervision)	<ul style="list-style-type: none"> <li>✓ Photoactivatable nanocomposite systems for MRI- guided minimally invasive glioblastoma therapy. 2023-2026 (ITMO-Skoltech-MIPT joint project, PI at ITMO University)</li> <li>✓ 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)</li> <li>✓ 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)</li> <li>✓ 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)</li> <li>✓ Development of new systems of chiral quantum dots and their applications. (Ministry of Science and Higher Education of the Russian Federation), 2013-2017 (researcher)</li> </ul>
List of potential thesis topics	<ul style="list-style-type: none"> <li>✓ R&amp;D of ROS nanogenerators based on molecular and nanoparticle sensitizers</li> <li>✓ R&amp;D of biocompatible magneto-luminescent nanostructures for target theranostics</li> <li>✓ R&amp;D of hybrid nanostructures for sensorics</li> </ul>
Publications in the last five years	55 (Scopus / Web of Science / RSCI)
Key publications	<ol style="list-style-type: none"> <li>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 AgInS<sub>2</sub>/ZnS Quantum Dots and Molecular Photosensitizers. <a href="https://doi.org/10.48550/arXiv.2309.09834">https://doi.org/10.48550/arXiv.2309.09834</a></li> <li>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</li> <li>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 Cd<sub>x</sub>Zn<sub>1-x</sub>Se<sub>y</sub>S<sub>1-y</sub>/ZnS Quantum Dots and Their Nanocomposites with SPIONs in Living Cells//International Journal of Molecular Sciences, 2022, Vol. 23, No. 7, pp. 4061</li> <li>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</li> <li>5. Stepanova M.S., Gromova Y.A., Dubavik A.Y., Maslov V.G., Orlova A.O., Zakharov V.V. Carbon Dot Films with Efficient</li> </ol>

	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	<ul style="list-style-type: none"> <li>✓ It has been proposed a model of photoinduced electron transfer in hybrid structures based on CdSe quantum dots and titanium dioxide</li> <li>✓ A model of energy transfer in structures with quantum dots, photosensitizers, and indicator molecules has been proposed</li> <li>✓ The regularities of energy / charge transfer in hybrid structures based on multilayer graphene nanoribbons and quantum-sized nanocrystals have been established</li> <li>✓ The regularities of the optical activity of semiconductor quantum nanocrystals, induced by chiral enantiomers have been established</li> </ul>
Supervisor's specific requirements	<p>A graduate student must have knowledge in the following areas:</p> <ul style="list-style-type: none"> <li>✓ molecular spectroscopy</li> <li>✓ solid state physics</li> </ul> <p>A postgraduate student must have experimental skills in spectroscopy including standard instrumentation (spectrophotometers, spectrofluorometer, DLS, Raman, FTIR)</p> <p>In addition, postgraduate student must have at least two of the following skills:</p> <ul style="list-style-type: none"> <li>✓ ability to work with modern laser microscopes</li> <li>✓ experience in experimental work devoted to optical properties of molecular objects or colloidal nanoparticles</li> <li>✓ 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</li> <li>✓ ability to write articles in English (availability of publications with first authorship)</li> <li>✓ proficiency in Origin, Wolfram Mathematica, Python etc.</li> </ul>
Code of the subject area of the PhD program	<p>1.3.6 Optics</p> <p>2.2.7 Photonics</p>