Portfolio of the academic advisor of the participants of the International Olympiad of the Global Universities Association on the track of postgraduate studies in 2022-2023

	**Olga E. Kvashenkina,** PhD in physic and mathematics (Peter the Great St. Petersburg Polytechnic University), Associate Professor, h-index 7 Director of the Scientific and Technological Center "Neuroprediction of Materials and Technologies of the Electronic Industry"
University	Peter the Great St. Petersburg Polytechnic University
English proficiency	Upper-Intermediate (B2)
Field of study on which the postgraduate student will be enrolled	ENGINEERING & TECHNOLOGY 2.2.3. Technology and equipment for electronics manufacturing COMPUTER & DATA SCIENCE 2.3.1. Systems analysis, control and information processing
List of research projects of a potential supervisor (participation / supervision)	• Development of nanostructured soldering materials based on metal composite systems and reactions self-propagating high- temperature synthesis (SHS) (leadership); • Development of fastening technology using SHS - foil elements of piezoelectric sensors and MEMS elements (leadership); • Development of a nanostructured strain-sensitive sensor based on multilayer metal structures (participation); • Development of technology for using reactive nanostructured material (leadership); • Development of technology for using SHS nanostructures (leadership); • Implementation of the technology of using reactive nanostructures in the manufacture of electronics using ceramic, piezoceramic and metal SMD elements (leadership); • Creating a sensor nanostructure based on multilayer foils Mo and C (participation); • Adaptation of SHS nanostructures for use in medical devices (leadership); • Investigation of the influence of the presence of Mo in SHS nanostructures of Al and Ni on the thermodynamic parameters of the solid combustion reaction (leadership); • Development of a technology for reactive SHS destruction of solar panel mounts for their full disclosure after putting them into low Earth orbit (leadership);

	• Other materials in 5G generation devices (leadership); • Integrated technology for creating multilayer nano structured materials for soldering a new generation (leadership).
List of possible research topics	• The effect of the phase composition of a multilayer nanostructure on the thermodynamic properties of self-propagating high-temperature synthesis in it. • The study of the dynamics of the propagation of structural changes in multilayer nanostructures during SHS. • The effect of the physical properties of nanomaterials on micro wave parameters in 5G equipment. • Development of a nanostructured sensor analyzer for the early diagnosis of lung cancer. • Development of new generation thermal interfaces based on multilayer nanostructures. • The effect of diamond-like forms of carbon on the properties of SHS in multilayer nanostructures. • The effect of fullerenes on the physical properties of SHS multilayer nanostructures.
Field of study	• new nano-structured materials in Industry 4.0 • nanotechnology • new materials for modern electronics • nanotechnology in medical application • technical physics
Supervisor's research interests	Materials for electronics, multilayer nanostructures, carbon nanostructures, self-propagating high-temperature synthesis, thermoelectricity, sensors, phase transition
Research highlights	Research will be carried out on the basis of unique latest equipment owned by the laboratory Selj-organizing high-temperature nanostructures. 1 he laboratory has equipment that carries out a full cycle of research work: from designing and creating samples of nanostructures (PVD and SVD) to their research using a set of advanced facilities. Graduate students will work in collaboration with: • Shanghai Institute of Technical Physics Chinese Academy of Sciences, Shanghai, China; • University of Trieste and Director of CNR-IOM, Italy; • National Academy of Sciences of Belarus, Minsk, Belarus; • Tsinghua University, Beijing, China. Additional funding for graduate students will occur in the framework of many research and development efforts. These works are held in the laboratory regularly.
Supervisor's specific requirements	**Possible areas of preparation:** • Electronics and Nano-Electronics; • Nanotechnology; • Technical Physics; • Physics; • Physical chemistry

	• Instrument making and electronics **Background Discipline:** • General classical physics; • Mathematical analysis; • Probability theory; • Basics of working with electronic devices; • Work in any software packages for modeling and / or design
Supervisor's main publications	• Pavel Gabdullin, Alexey Zhurkin, Vasiliy Osipov, Nadezhda Besedina, Olga Kvashenkina, Alexander Arkhipov Thin carbon films: Correlation between morphology and field-emission capability (2020) Elsevier, Diamond & Related Materials, Volume 105. May 2020, 107805 https://www.sciencedirect.com/science/article/abs/pii/S0925963519307277?via%3Dihub https://doi.org/10.1016/j .diamond.2020.107805 **IF 2.27 QI** • Alexandr Vorobyev, Yaroslav Sedov, Polina Bespalova, Alexandr Shakhmin, Anastasia Kondrateva, Pavel Gabdullin, Olga Kvashenkina, Alexey Mikhaylov, Maxim Mishin Controlled formation of iron oxide nanoparticles by pulse-modulated RF discharge at atmospheric pressure (2020) https://www.sciencedirect.com/science/article/pii/S2214785320300257via%3Dihub https://doi.Org/10.1016/i.matpr.2019.12.388 **IF 7,39 QI** • Kvashenkina, O.E., Gabdullin, P.G., Osipov, V.S. Using the novel capable of SHS-reaction multilayer nano structured material for soldering of lead-zirconate-titanate piezoceramic elements (2019); Journal of Physics: Conference Series https://iopscience.iop.Org/article/10.1088/1742-6596/1236/l/012023 Q3 • Osipov, V.S., Besedina, N.A., Gabdullin, P.G., Kvashenkina, O.E., Arhipov, A.V. Study of nanocarbon thin-film field-electron emitters by Raman spectroscopy (2019) Journal of Physics: Conference Series https://iopscience.iop.Org/article/10.1088/1742-6596/1236/l/012005 Q3 • Kvashenkina, O.E., Gabdullin, P.G., Arkhipov, A.V. Smartfoil: A novel assembly technology for electronic circuit boards in multifunctional units (2018) Proceedings of the 2018 IEEE International Conference on Electrical Engineering and Photonics, EExPolytech 2018 December 2018, № 8564437, Pages 202-206 DOI: 10.1109/EExPolytech.2018.8564437 https://www.researchgate.net/publication/329620555□SmartFoil_a_Novel_Assembly_Technology_for_Electronic_Circuit_Boards_in_Multifunctional_Units
Results of intellectual activity	• The technology of ultrafast fastening of metals using SHS-nanostructure (SmartFoil)

	• Technological conditions for the use of materials with self-propagating high-temperature synthesis occurring in them in the installation of piezoceramic elements have been created • The patent for the invention is filed: a method for producing multilayer energy-producing nanostructured foils for joining materials • An international patent for an invention is filed: a method for producing multilayer reactive nanostructures • Two patent applications have been filed for a method of using reaction nanostructures for mounting piezoceramics, and for mounting microwave