

Researcher profile (portfolio) form for potential research supervisors of postgraduate track participants in the Global Universities Association International Olympiad for graduate and postgraduate applicants

University	Tomsk Polytechnic University
Level of English proficiency	B2 (FCE)
Educational program and field of the educational program for which the applicant will be accepted	<p><i>A) 1.1. Mathematics and Mechanics (educational program)</i> <i>1.1.9. Mechanics of fluid, gas and plasma (field of the educational program)</i></p> <p><i>B) 2.4. Power Engineering and Electrical Engineering</i> <i>2.4.6. Theoretical and applied heat engineering</i></p> <p><i>C) 1.3. Physical Sciences</i> <i>1.3.17. Chemical physics, combustion and explosion, physics of extreme states of matter</i></p>
List of research projects of the potential supervisor (participation/leadership)	<ol style="list-style-type: none"> 1. Ministry of Science and Higher Education of the Russian Federation, Project Priority-2030- NIP/EB-038-375-2023. Closed-cycle multi-fuel technologies for power plants and engines. 2022-2025. Executor (Ground Propulsion Systems Group, biodiesel production). 2. Russian Science Foundation, Project No. 23-71-10080. Interaction of liquid droplets with surfaces of structural elements of airborne aircraft. 2023-2026. Main Executor. 3. State assignment of the Department of Education and Science of Khanty-Mansiysk Autonomous Okrug - Yugra (Project No. 2023-578-05 Development of droplet microfluidics methods for high-precision production of pharmaceutical forms in Khanty-Mansiysk Autonomous Okrug). 2024-2026. Supervisor.
List of the topics offered for the prospective scientific research	<p>List of 7-10 scientific topics, which are offered by the research supervisor for consideration of foreign applicants (During the course of the Interview the topic may be modified according to specific area of scientific interest of the applicant)</p> <ol style="list-style-type: none"> 1. Droplet microfluidics in the problems of microencapsulation of dietary supplements and drugs. 2. Droplet microfluidics in bioengineering and 3D bioprinting. 3. Droplet microfluidics in the tasks of targeted drug delivery. 4. Droplet microfluidics in enhanced oil recovery. 5. Production of fatty acid methyl esters from vegetable oils by droplet microfluidics. 6. Combustion and gas analysis of liquid biofuels in industrial and semi-industrial power and propulsion plants. 7. High-speed collision of liquid droplets with textured superhydrophobic surfaces to solve problems of anti-icing and creation of self-cleaning coatings
	<p><i>Заголовок (указывается направление международной карты науки, соответствующее области исследования, карта науки доступна по ссылке)</i></p>



Research supervisor:

Maxim V. Piskunov,

Candidate of Science
(Tomsk State University)

Supervisor's research interests

Research interests include experimental and numerical studies in liquid droplet-wall impact, droplet microfluidics and the conversion of biomass waste into value-added products.

Research highlights (*при наличии*)

-Use of high-precision analytical equipment and high-speed video recording facilities.

-The scientist and his research is integrated into world science (see co-authors in publications).

-Research is conducted under research grants and therefore financial support for a PhD student may be considered.

Supervisor's specific requirements:

Engineering education, knowledge of the basics of heat and mass transfer, office software skills, basic academic writing skills (ability to express cause-and-effect relationships in the text), high level of spoken English and/or Russian language

Total number of publications in journals indexed by Web of Science, Scopus, RSCI for the last 5 years: 48

5 most significant publications with indication of output data:

1. *Khomutov N., Misyura S., Piskunov M., Semyonova A., Strizhak P., Volkov R. Convective heat transfer in droplets of fuel microemulsions during conductive heating // Exp. Therm. Fluid Sci. 2021. T. 120.*

<https://www.sciencedirect.com/science/article/pii/S0894177720307627>

DOI: 10.1016/j.expthermflusci.2020.110258

IF=3.37 JCR Science Edition

2. *Piskunov M., Semyonova A., Khomutov N., Ashikhmin A., Yanovsky V. Effect of rheology and interfacial tension on spreading of emulsion drops impacting a solid surface // Phys. Fluids. 2021. T. 33, № 8. C. 83309.*

<https://aip.scitation.org/doi/10.1063/5.0059079?af=R&feed=most-recent>

DOI: 10.1063/5.0059079

IF=4.98 JCR Science Edition

3. *Piskunov M. et al. Unsteady convective flow of a preheated water-in-oil emulsion droplet impinging on a heated wall // Phys. Fluids. 2022. Vol. 34, № 9. P. 93311.*

<https://doi.org/10.1063/5.0107628>

doi:10.1063/5.0107628

IF=4.98 JCR Science Edition

4. *Piskunov M. et al. Effects of wall temperature and temperature-dependent viscosity on maximum spreading of water-in-oil emulsion droplet // Int. J. Heat Mass Transf. 2022. Vol. 185. P. 122442.*

<https://www.sciencedirect.com/science/article/pii/S0017931021015404>

DOI: 10.1016/j.ijheatmasstransfer.2021.122442

IF=5.431 JCR Science Edition

5. *Piskunov M. et al. Secondary atomization of water-in-oil emulsion drops impinging on a heated surface in the film boiling regime // Int. J. Heat Mass Transf. 2021. Vol. 165. P. 120672.*

	<p>https://www.sciencedirect.com/science/article/pii/S0017931020336085?via%3Dihub DOI: 10.1016/j.ijheatmasstransfer.2020.120672 IF=5.431 JCR Science Edition</p>
	<p>Results of intellectual activity</p> <p>A) Author of 94 articles published in journals indexed in SJR Scopus, more than half of which belong to Q1/Q2: https://www.scopus.com/authid/detail.uri?authorId=56346964300</p> <p>B) Certificates of state registration of programme for computer and Patent for invention:</p> <ol style="list-style-type: none"> 1. Certificate of state registration of programme for computer ‘Calculation of heating characteristics of a heterogeneous water droplet with a solid inclusion in a high-temperature gas medium’. 2015. №2015617828. Bulletin No. 3. 2. Certificate of state registration of programme for computer ‘Calculation of characteristics of phase transformations of inhomogeneous water drop in high-temperature gas medium’. 2015. №2015617829. Bulletin No. 3. 3. Certificate of state registration of programme for computer ‘Calculation of characteristics of explosive vapour formation of inhomogeneous water drop in high-temperature gas medium’. 2015. №20156117834. Bulletin No. 3. 4. Certificate of state registration of programme for computer ‘Calculation of characteristics of vapour gap at the boundary “solid inclusion - liquid” at explosive vapour formation of inhomogeneous water droplet in high-temperature gas environment’. 2015. №2015617835. Bulletin No. 3. 5. Certificate of state registration of programme for computer ‘Calculation of characteristics of adiabatic evaporation of a drop of water in a gas medium’. 2015. №2015617832. Bulletin No. 3. 6. Certificate of state registration of programme for computer ‘Calculation of characteristics of complex heat exchange of a drop of water with a high-temperature gas medium’. 2015. №2015618118. Bulletin No. 3. 7. Certificate of state registration of programme for computer ‘Calculation of evaporation characteristics of typical impurities in a drop of water in a high-temperature gas medium’. 2015. №2015618643. Bulletin No. 3. 8. Certificate of state registration of programme for computer ‘Calculation of the time of existence of a group of inhomogeneous drops in a high-temperature gas medium’. 2016. №2016616465. Bull No. 3. 9. Certificate of state registration of pro-gram for computer ‘Calculation of water vapour concentration in the near-surface layer of an inhomogeneous water drop during heating in a high-temperature gas medium’, date of state registration in the Register of Computer Programs - 14.06.2016, №2016616466. Bulletin No. 3. 10. Certificate of state registration of the computer program ‘Calculation of the characteristics of evaporation of an inhomogeneous drop at the energy supply to the interface through the inclusion and the liquid film’, date of state registration in the Register of Computer Programs - 20.06.2016, №2016616807. Bulletin No. 3. 11. Certificate of state registration of computer program ‘Calculation of time of complete evaporation of heterogeneous water

	<p>droplets with the addition of solid inclusions of different sizes and concentrations’, date of state registration in the Register of computer programs - 20.06.2016 №2016616809. Bull. no. 3.</p> <p>12. Certificate of state registration of computer program ‘Calculation of characteristics of water evaporation from the surface of an inhomogeneous drop with a metal inclusion’, date of state registration in the Register of Computer Programs - 18.08.2016, №2016619364. Bulletin No. 3.</p> <p>13. Patent for invention of the Russian Federation ‘Device for generation of sequentially moving liquid droplets’. RU 2606090 C1 dated 10.01.2017.</p> <p>14. Certificate of state registration of the computer program ‘Calculation of the temperature field of an intensively heated two-liquid droplet before its explosive disintegration’, date of state registration in the Register of Computer Programs - 20.08.2018 №2018661379.</p> <p>15. Certificate of state registration of the computer program ‘Calculation of the change in the heating rate of evaporation of a water drop on the holder’, date of state registration in the Register of Computer Programs - 20.08.2018 №2018661690.</p> <p>16. Certificate of state registration of computer program ‘Calculation of temperature and velocity fields of intensively evaporating water drop’, date of state registration in the Register of computer programs - 20.08.2018 №2018661692.</p>
--	---