



TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO

ID CODE 6204

I the undersigned asks to participate in the public selection, for qualifications and examinations, for the awarding of a type B fellowship at **Dipartimento di Biotecnologie Mediche e Medicina Traslazionale**

Scientist- in - charge: **Prof. Valeria Rondelli**

Anastasiia Murmiliuk

CURRICULUM VITAE

PERSONAL INFORMATION

Surname	Murmiliuk
Name	Anastasiia

PRESENT OCCUPATION

Appointment	Structure
Postdoctoral Researcher	Jülich Centre for Neutron Science (JCNS) at Heinz Maier-Leibnitz Zentrum (MLZ), Forschungszentrum Jülich GmbH, Germany

EDUCATION AND TRAINING

Degree	Course of studies	University	year of achievement of the degree
Degree	Fundamental and Applied Chemistry (Specialist degree equivalent to master's degree)	Saint Petersburg State University, Saint Petersburg, Russian Federation	2016
Specialization			
PhD	Physical Chemistry	Charles University, Prague, Czech Republic	2021
Master			
Degree of medical specialization			
Degree of European specialization			
Other			



FOREIGN LANGUAGES

Languages	level of knowledge
English	B2 (Cambridge English Level 1 Certificate in ESOL International (First))
Russian	native
Czech	B1
German	B1

AWARDS, ACKNOWLEDGEMENTS, SCHOLARSHIPS

Year	Description of award
2019	Grant Agency of the Charles University (GAUK), Prague, Czech Republic, "Solubilization and release of low molar-mass compounds from multicompartment nanoparticles with soft hydrophobic core" project No. 1375219, 2 years (19 000€)
2019	Travel award for the participation in the conference Okinawa Colloids 2019
2019	Travel award for the participation in the conference SoftComp & EUSMI Annual Meeting 2019
2018	Travel award for the participation in the conference SoftComp & EUSMI Annual Meeting 2018
2016	Diploma Cum Laude, St. Petersburg State University
2011	Gold medal "For special successes in study", St. Petersburg secondary school №473

TRAINING OR RESEARCH ACTIVITY

During my **Master's** studies at Saint Petersburg State University, I focused on polymer synthesis and modification, gaining expertise in designing and synthesizing multifunctional polymers with chelating or antiradical properties. This experience allowed me to understand the structure-property relationships in polymers and explore different strategies for modifying their chemical structure through the introduction of biologically active compounds via covalent bonds. The graduation project "Polymer-flavonoid conjugates" was supervised by Prof. N.S. Domnina and P.S. Vlasov.

For **Ph.D.** research at Charles University, I shifted my focus to investigating self-assembly of block copolymers with polyelectrolyte blocks and their co-assembly with surfactants, low-molecular-weight compounds, polyelectrolytes, peptides, and proteins based on electrostatic or hydrophobic interactions to design nanoparticles for targeted drug delivery. The doctoral project "Multidimensional characterization of polyelectrolytes and interpolyelectrolyte complexes in aqueous solutions" was supervised by Prof. RNDr. Miroslav Štěpánek, Ph.D. I investigated morphology of the formed complexes and their ability to encapsulate and release hydrophobic and ionic drugs. I received funding from the Grant Agency of Charles University for my 2-year project "*Solubilization and release of low molar-mass compounds from multicompartment nanoparticles with a soft hydrophobic core*," where I served as the principal investigator. Moreover, I conducted extensive studies to understand how proteins and peptides interact with polymer assemblies, influencing their morphology and properties. This research provided valuable insights into the mechanisms of polymer-polymer and protein-polymer interactions, enabling the development of bio-inspired nanocapsules for targeted delivery. During my Ph.D. study, I had an internship at the Technical University of Berlin in the Research group of Prof. Dr. Michael Gradzielski, where I studied interfacial properties of polymeric nanoparticle solutions. As a result of my Ph.D. research, I have published 12 scientific articles (4 as a first author, 8 as a co-author, 1 cover page) and participated in 8 international conferences (6 lectures, 2 posters) and 2 schools on microscopy.

I have pursued **postdoctoral** research projects at Forschungszentrum Jülich, where I continued to investigate the interaction between polymers and proteins to design stimuli-responsive nano-capsules for



simultaneous encapsulation of proteins and small molecules. I further explored the stimuli-responsiveness of polyelectrolyte-protein complexes and the effect of protein nature on their morphology and controlled release properties. Currently, I study adsorption of antigen specific peptides on lipid membranes for targeted delivery of oncolytic viruses. These experiences have deepened my understanding of the practical applications and potential limitations of biodegradable nano-capsules for drug delivery. My research includes experimental work at international large-scale facilities such as synchrotrons and neutron reactors, and collaboration with scientific groups from around the globe. In total, for 2.5 years of my postdoctoral work, 11 applications for experiments at synchrotrons and reactors with me as the principal investigator were funded. I presented the results of my postdoctoral research at 7 conferences (1 invited talk, 4 lectures, 2 posters).

PROJECT ACTIVITY

Year	Project
2019-2020	Principle investigator of the project funded by Grant Agency of the Charles University (GAUK), Prague, Czech Republic, "Solubilization and release of low molar-mass compounds from multicompartiment nanoparticles with soft hydrophobic core" project No. 1375219, 2 years (19 000 €)
2023	Principal investigator of SANS experiment at YS-SANS instrument at BNC, Budapest, Hungary, „Contrast variation study of peptide interaction with lipid and polymeric membranes mimicking oncolytic viruses”, proposal <i>BRR_724</i> - 3 days of SANS beamtime
2023	Principal investigator of SANS experiment at SANS-J beamline at Japan Atomic Energy Agency JRR3, Tokai, Japan, "Contrast variation study of peptide interaction with lipid and polymeric membranes mimicking oncolytic viruses", proposal 867 - 2 days of SANS beam time
2023	Principal investigator of SANS experiment at BL15 TAIKAN instrument at J-Parc, Tokai, Japan, „Contrast variation study of peptide/polyelectrolyte complexes for targeted delivery“, Proposal 2022B0260 - 2.5 days of SANS beam time
2023	Principal investigator of neutron reflectivity experiment at Platypus beamline at ANSTO, Lucas Heights, Australia, "Neutron reflectivity study of the antigen peptide adsorption on lipid and polymeric membranes", proposal P 16938 - 3 days of beamtime (ca. 32000 €)
2022	Principal investigator of small-angle neutron scattering (SANS) experiment at YS-SANS instrument at BNC, Budapest, Hungary, "Contrast variation study of protein/polyelectrolyte complexes", proposal BNC-LENS-672 - 3 days of SANS beamtime
2022	Principal investigator of SANS experiment at P12 beamline at the Petra III storage ring at DESY, Hamburg, Germany "SEC-SAXS study of protein/polyelectrolyte complexes with encapsulated drug" European Molecular Biology Laboratory (EMBL) proposal HH-SAXS-1226, 2 days of SEC-SAXS beamtime
2022	Principal investigator of SANS experiment at TPS13A beamline at the NSRRC synchrotron, Hsinchu, Taiwan "HPLC-SAXS study of protein/polymer complexes with encapsulated drug" proposal 2022-2-137-1, 1 day of SEC-SAXS beamtime
2022	Principal investigator of SANS experiment at SANS-J beamline at Japan Atomic Energy Agency JRR3, Tokai, Japan, "Contrast variation study of protein/polyelectrolytes complexes with encapsulated drug", proposal 636 - 3 days of SANS beam time
2022	Principal investigator of SANS experiment at BL15 TAIKAN instrument at J-Parc, Tokai, Japan, "Contrast variation study of protein/polyelectrolyte complexes with encapsulated drug for targeted delivery", proposal 2022A0356 - 2.5 days of SANS beam time,
2022	Principal investigator of SANS experiment at Quokka beamline at ANSTO, Lucas Heights, Australia, "Contrast variation study of protein/polyelectrolyte complexes with encapsulated drug", proposal P14494 - 3 days of SANS beam time



2021	Principal investigator of SANS experiment at D11 instrument at Institut Max von Laue (ILL), Grenoble, France “Contrast variation studies of protein/polyelectrolyte complexes with encapsulated drug”, proposal 9-13-1033, 2 days of SANS beam time
2020	Principal investigator of SANS experiment at KWS-2 beamline at MLZ, Garching, Germany “Contrast variation studies of the internal structure of the multicompartiment micelles with soft poly(lauryl acrylate) core” European Soft Matter Infrastructure, proposal E190600299, 2 days of SANS beamtime

CONGRESSES AND SEMINARS

Date	Title	Place
04-08.09.2023	Lecture „Polyelectrolyte/protein synergism for the design of reversible pH-responsive micelles and targeted drug delivery”	The 7th International Soft Matter Conference, ISMC2023, Osaka, Japan
04-05.06.2023	Invited talk “Structural design of polyelectrolyte-protein nanocarriers for targeted drug delivery”	4th Virtual Online Polymer Conference, online
23-27.04.2023	Lecture “Reversible pH-responsive polyelectrolyte/protein complexes for targeted delivery”	14th Advanced Polymers via Macromolecular Engineering Conference (APME23), Paris, France
20-23.03.2023	poster “Structural design of polyelectrolyte-protein nanocarriers for targeted drug delivery”	European Conference on Neutron Scattering (ECNS2023), Garching, Germany
17-22.09.2022	poster “Structural Design of Polyelectrolyte-protein Nanocarriers for Targeted Drug Delivery”	XVIII International Small Angle Scattering Conference (SAS2022), online, Sao Paulo, Brazil
30-31.03.2022	lecture “Structural design of polyelectrolyte-protein nanocarriers for targeted drug delivery”	French-Swiss Meeting SANS for Soft Matter, Strasbourg, France
09-12.11.2021	lecture “Structural design of polyelectrolyte/protein nanocarriers for targeted protein and drug delivery”	Polysolvat-13, online, Osaka, Japan
18-22.10.2020	lecture “Comprehensive multidimension characterization of novel interpolyelectrolyte complexes in aqueous solution: looking from time, size and q-space perspectives.”	Czech-Bavarian mini-school on large scale facilities and open data, online, Garching, Germany
03-08.11.2019	lecture “Three-layered onion micelles with soft poly(lauryl acrylate) core: co-assembly and morphological transition”	Okinawa Colloids 2019, Okinawa, Japan
08-10.10.2019	lecture “Three-layered onion micelles with soft poly(lauryl acrylate) core: co-assembly and morphological transition”	SoftComp&ESMI Annual Meeting, Ancona, Italy
05-07.06.2019	lecture “Three-layered onion micelles with soft poly(lauryl acrylate) core: co-assembly and morphological transition”	Nordic Polymer Days, Trondheim, Norway
09-13.12.2018	poster “Formation of core/corona nanoparticles with interpolyelectrolyte complex cores: Insight in chain dynamics in the complex from fluorescence quenching”	Umbrella Winter School, Haifa, Israel



27-31.08.2018	lecture "Two names for one quantity: local pH and effective pK"	12th International Symposium on Polyelectrolytes, Wageningen, the Netherlands
28-31.05.2018	lecture "Fluorescence application for investigation of polyelectrolytes and interpolyelectrolyte complexes"	SoftComp&ESMI Annual Meeting, Primosten, Croatia
05.2018	lecture "Application of fluorescence in studies of polyelectrolytes and interpolyelectrolyte complexes"	Charles University & University of St Andrews CUCAM Workshop, St Andrews, UK
09-12.10.2017	poster "Fluorescent-labeled poly(methacrylic acid) and its interpolyelectrolyte complexes with poly[3,5-bis(trimethylammoniummethyl)-4-hydroxystyrene iodide]-b-poly(ethylene oxide) in aqueous solution"	Kolloid-Tagung and FCS workshop, Munich, Germany
14-18.05.2017	poster "Interpolyelectrolyte complexes of poly(methacrylic acid) and poly[3,5-bis(trimethylammoniummethyl)-4-hydroxystyrene iodide]-block-poly(ethylene oxide) in aqueous solution"	(bio)Macromolecular Ionic Systems, Hrubá Skála, Czech Republic
02-05.04.2013	poster "The influence of additives on the properties of chlorine lithium-silicate glasses containing the second modifier." (poster) "The synthesis of new analogues of steroid estrogens containing fluorine in 2 nd position."	7th All-Russian conference of young scientists and students in chemistry and nanomaterials 'Mendeleev-2013', St. Petersburg, Russia

PUBLICATIONS

Articles in reviews
Filippov S. K., Khusnutdinov R., Murmiliuk A. , Inam W., Zakharova L.Y., Zhang H., Khutoryanskiy V.V. "Dynamic light scattering and transmission electron microscopy in drug delivery: a roadmap for correct characterization of nanoparticles and interpretation of results" <i>Materials Horizons</i> , 2023,10, 5354-5370. doi.org/10.1039/D3MH00717K
Murmiliuk A. , Hladys S., Filippov S., Štěpánek, M. "Comprehensive Multidimensional Characterization of Polyelectrolytes and Interpolyelectrolyte Complexes in Aqueous Solutions" <i>Reviews and Advances in Chemistry</i> , 2022, 12, 163-177. doi.org/ 10.1134/S263482762260013X
Lunkad, R.; Biehl, P.; Murmiliuk, A. ; Blanco, P. M.; Štěpánek, M.; Schacher, F. H.; Košovan, P "Simulations and Potentiometric Titrations Enable Reliable Determination of Effective pKa Values of Various Polyzwitterions" <i>Macromolecules</i> , 2022, 55, 7775. Doi.org/10.1021/acs.macromol.2c01121
Kaberov, L. I.; Kaberova, Z.; Murmiliuk, A. ; Trousil, J.; Sedláček, O.; Konefal, R.; Zhigunov, A.; Pavlova, E.; Vít, M.; Jiráček, D.; Hoogenboom, R.; Filippov, S. "Fluorine containing block and gradient copoly(2-oxazoline)s based on 2-(3,3,3-trifluoropropyl)-2-oxazoline): A quest for the optimal self-assembled structure for 19F imaging" <i>Biomacromolecules</i> , 2021, 12;22(7):2963-2975. doi.org/10.1021/acs.biomac.1c00367
Murmiliuk, A. ; Filippov, S. K.; Rud, O.; Košovan P.; Tošner, Z.; Šlouf, M.; Radulescu, A.; Skandalis, A.; Pispas S.; Štěpánek M. "Reversible multilayered vesicle-like structures with fluid hydrophobic and interpolyelectrolyte layers"



Journal of Colloid and Interface Science. 2021, 599, 313-325. doi.org/10.1016/j.jcis.2021.04.050
Lunkad, R.; Murmiliuk, A.; Tošner, Z.; Štěpánek, M.; Košovan, P. “Role of pKa in charge regulation and conformation of various peptide sequences” Polymers (MDPI), 2021, 13(2), 214. doi.org/10.3390/polym13020214
Lunkad R.; Murmiliuk, A.; Hebbeker P.; Boublík M.; Tošner Z.; Štěpánek M.; Košovan P. “Quantitative prediction of charge regulation in oligopeptides” Molecular Systems Design & Engineering, 2021, 6, 122-131. doi.org/10.1039/D0ME00147C
Skandalis A.; Murmiliuk, A.; Štěpánek M.; Pispas S. “Physicochemical evaluation of insulin complexes with QPDMAEMA-b-PLMA-b-POEGMA cationic triblock terpolymer micelles” Polymers, 2020, 12(2), 309. doi.org/10.3390/polym12020309
Murmiliuk A.; Matějčíček P.; Filippov S.K.; Janata M.; Šlouf M.; Pispas S.; Štěpánek M. “Formation of core/corona nanoparticles with interpolyelectrolyte complex cores in aqueous solution: insight into chain dynamics in the complex from fluorescence quenching” Soft Matter, 2018, 14, 7578-7585 (cover page). doi.org/10.1039/C8SM01174E
Murmiliuk A.; Košovan P.; Janata M.; Procházka K.; Uhlík F.; Štěpánek M. “Local pH and Effective pK of a Polyelectrolyte Chain: Two Names for One Quantity?” ACS Macro Letters, 2018, 7 (10), 1243-1247. doi.org/10.1021/acsmacrolett.8b00484
Hladysh, S.; Murmiliuk, A.; Vohlídal, J.; Havlíček, D.; Sedlařík, V.; Štěpánek, M.; Zedník J. “Combination of phosphonium and ammonium pendant groups in cationic conjugated polyelectrolytes based on regioregular poly(3-hexylthiophene) polymer chains” European Polymer Journal, 2018, 100, 200-208. doi.org/10.1016/j.eurpolymj.2018.01.029
Hladysh, S.; Murmiliuk, A.; Vohlídal, J.; Zedník J. “Attachment of a 1,8-naphthalimide moiety to a conjugated polythiophene efficiently improves the sensing abilities of naphthalimide-based materials” Macromolecular Chemistry and Physics, 2019, 220, 1800436. doi.org/10.1002/macp.201800436

OTHER INFORMATION

<u>Student Supervision</u> Master’s Student - BSc. Zhuldyzay Kurmanova, “Three stories of cellular uptake: fatty acid, phospholipid, and polymeric vesicles” within International Helmholtz Research School of Biophysics and Soft Matter (IHRS BioSoft), 2023
<u>Scientific Skills</u> <ul style="list-style-type: none">• <i>Physicochemical characterization techniques</i>: Small-angle neutron and X-ray scattering, (SANS, SAXS), light scattering, Quartz Crystal Microbalance (QCM-D), Atomic force microscopy (AFM), Transmission Electron Microscopy (TEM), Fluorometry (steady-state, time-resolved, anisotropy), nuclear magnetic resonance (NMR), FTIR, UV-vis spectroscopy, Isothermal Titration Calorimetry (ITC), Differential Scanning Calorimetry (DSC), size exclusion chromatography (SEC)• <i>Organic and inorganic synthesis</i>• <i>Basic programming in Python</i>
<u>Research Interests</u> <ul style="list-style-type: none">• Lipid and polymeric membranes• Peptide adsorption on membranes• Liposomes and polymersomes• Polymer/protein complexes



- Association of polymers, lipids and surfactants in solution
- Charge regulation of polyelectrolytes, peptides, and proteins
- Targeted drug delivery
- Organic synthesis, polymer modification

Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

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Place and date: Munich, 08.01.2024