
Research Experience

Postdoctoral Research Associate

Oak Ridge National Laboratory, Oak Ridge, TN

November 2020 - Present

- Design of self-healing high-performance elastomers
- Synthesis and Characterization of Supramolecular Crown Ether Adhesives
- Surface Modification of Carbon Fiber for Advanced Epoxy Composites

Research Scientist

North Dakota State University, Fargo, ND

October 2020 - November 2020

- Material process optimization and scale-up
- Design of biobased latex adhesives for multi-substrate applications

Industrial Internship

Lonza, Inc., Morristown, NJ

February - June 2020

- Evaluation of bio-based polymer incorporation in personal care products
- Development and launching the new line of personal care products from renewables

Graduate Teaching Assistant

North Dakota State University, Fargo, ND

January - May 2019

- Students' training on polymer synthesis, experimental design, testing, and material characterization skills
- Students' inspiration to develop independent thinking by guiding them to design their experiments
- Maintaining overall safety throughout the class period and demonstrating integrity while assessing student reports and laboratory performance

Graduate Research Assistant

North Dakota State University, Fargo, ND

August 2015 - September 2020

- The synthesis of plant oil-based acrylic latexes using (mini)emulsion polymerization
- Surface modification (hydrophobization) of nano cellulose through interfacial polymerization
- Synthesis and characterization of bio-based hydrogels for biomedical applications
- Design of amphiphilic copolymers for drug-delivery applications
- Life cycle assessment of the synthesis of the bio-based monomers

Education

Doctoral in Polymer Chemistry

North Dakota State University (NDSU), Fargo, ND, USA

August 2015- November 2020

PhD Study in Macromolecular Chemistry

Lviv Polytechnic National University, Lviv, Ukraine

December 2013 - May 2015

Master of Science in Chemical Technology of Food Additives and Cosmetics

Lviv Polytechnic National University, Lviv, Ukraine

August 2012 - December 2013

Bachelor of Science in Chemical Technology and Engineering

Lviv Polytechnic National University, Lviv, Ukraine

September 2008 - June 2012

Overall **4.0 GPA** while working full-time – Recipient of Organic Chemistry Department Scholarships (2008-2015)

Dean's List– Graduated with Honors for Outstanding Grade and Research

Summary of Graduate Coursework Completed:

GPA-3.71 (140 credits out of 90)

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| • Polymer Synthesis | • Organic Chemistry of Coatings |
| • Applied Polymer Science (Coatings I) | • Color and Appearance |
| • Coatings' Materials Science (Coatings II) | • Physical Chemistry of Polymers |
| • Coatings I Laboratory | • Physical Chemistry of Coatings |
| • Corrosion and Materials | • Advanced Surface Analysis |
| • Modern Methods of Polymer Characterization | • Biomaterials for Biomedical Applications |

Skills

- Proficient in MS Excel, MS Word, MS PowerPoint, MS Project, MS Outlook
- Proficient in **ChemDraw, ACD Lab, ChemWindow, Origin, TA Instruments, SimaPro V8**
- Proficient in polymer characterization including **¹H NMR, FTIR, XRD, TEM, DSC, DMA, TGA methods, ARES Rheometry, ESI-Mass Spectrometry, Elemental Analysis, UV-Vis Spectroscopy, Tensile Testing, DLS**

Professional Associations

- American Chemical Society (ACS)
- Center for Sustainable Material Science (CSMS)
- American Oil Chemists' Society (AOCS)
- International Society for Industrial Technology (ISIT)
- The Society for Protective Coatings (SSPC)

Volunteering and Extracurricular Activities

Chair/Judge Assistant, North Dakota State Olympiad 2017-2019 April 2017-2019

- Assisted to organize and run the ND State Olympiad 2017 and 2019 in Forensics for high school students
- Served as a judge to help make decisions and evaluate the participants' knowledge

NDSU Research Representative, ACS, CSMS, Fiber Society August 2015 - Present

- Represent NDSU in annual national and regional conferences introducing research study and analysis
- Recruit sponsors to raise funds for our projects presenting a research study to the industrial partners

Mentor, North Dakota State University August 2015 –November 2020

- Tutoring undergraduate students through the Summer Undergraduate Research Experience Program, NDSU

Honors and Awards

- AOCS Industrial Oil Products Division Student Award, February **2021**
- Scholarship from The Society for Protective Coatings, May **2020**
- Scholarship from PPG Industries, May **2020**
- Best Poster Award – Coatings+ 2020, Long Beach, CA, February **2020**
- NSF Award - Internship funding in Lonza, Inc., Feb-July **2020**
- Scholarship from National Science Foundation (NSF), June **2019**
- Scholarship from The Society for Protective Coatings, June **2019**
- Scholarship from PPG Industries, April **2019**
- Scholarship from International Society for Industrial Technology, May **2019**
- Best Poster Award – NDSU-KU International Joint Symposium **2019**, Fargo, ND, USA
- Best Poster Award – International Symposium “Materials from Renewables” **2018**, Fargo, ND, USA
- Best Poster Award – Fiber Society Conference **2017**, Athens, GA, USA

Publications

1. K. Patnode, Z. Demchuk, S. Johnson, A. Voronov, B. Rasulev Computational Protein–Ligand Docking and Experimental Study of Bioplastic Films from Soybean Protein, Zein, and Natural Modifiers *ACS Sustainable Chem. Eng.* **2021**. DOI: 10.1021/acssuschemeng.1c01202.
2. Z. Demchuk, S. Choudhary, A.M. Mora, Sylvain Caillol, Andriy Voronov Biobased Latexes from Natural Oil Derivatives *Industrial Crops and Products*, **2021**, 162, 113237.
3. N. Wu, Z. Demchuk, Gh. Pourhashem, A. Voronov Sustainable manufacturing of polymeric materials: A techno-economic analysis of soybean oil-based acrylic monomers production *Journal for Cleaner Prod.*, **2021**. DOI: 10.1016/j.jclepro.2020.124939.
4. A. Kohut, S. Voronov, Z. Demchuk, V. Kirianchuk, K. Kingsley, O. Shevchuk, A. Voronov Emulsion Polymerization of Plant Oil-Based Acrylic Monomers: Resourceful Platform for Biobased Waterborne Materials *ACS Symposium Series 1372, Sustainable & Green Pol. Chem. Vol. 1: Green Prod. and Proc.* **2020**, Ch. 3, 27-66. DOI: 10.1021/bk-2020-1372.ch003.
5. A. Kohut, S. Voronov, Z. Demchuk, V. Kirianchuk, K. Kingsley, O. Shevchuk, S. Caillol, A. Voronov Non-Conventional Features of Plant Oil-Based Acrylic Monomers in Emulsion Polymerization *Molecules*, **2020**, 25, 2990. DOI: 10.3390/molecules25132990.

6. Z. Demchuk, N. Wu, Gh. Pourhashem, A. Voronov Life Cycle Environmental Impact Considerations in the Design of Soybean Oil-Based Acrylic Monomers *ACS Sustainable Chemistry & Engineering*. **2020**, 8, 34, pp. 12870–12876. DOI: 10.1021/acssuschemeng.0c03266.
7. Z. Demchuk, W. S. Jennifer Li, Hermella Eshete, Sylvain Caillol, Andriy Voronov Synergistic Effects of Cardanol- and High Oleic Soybean Oil Vinyl Monomers in Miniemulsion Polymers *ACS Sustainable Chemistry & Engineering*, **2019**, 7, 10, pp. 9613-9621. DOI: 10.1021/acssuschemeng.9b01137.
8. A. Kohut, Z. Demchuk, K. Kingsley, S. Voronov, A. Voronov Dual role of methyl- β -cyclodextrin in the emulsion polymerization of highly hydrophobic plant oil-based monomers with various unsaturations *European Polymer Journal* **2018**, 108, pp.322-328. DOI: 10.1016/j.eurpolymj.2018.09.010.
9. Z. Demchuk, V. Kirianchuk, K. Kingsley, S. Voronov, A. Voronov Plasticizing and Hydrophobizing Effect of Plant Oil-Based Acrylic Monomers in Latex Copolymers with Styrene and Methyl Methacrylate *IJTAN*, **2018**, pp. 29-37. DOI: 10.11159/ijtan.2018.005.
10. Z. Demchuk, A. Kohut, S. Voronov, A. Voronov Versatile Platform for Controlling Properties of Plant Oil-Based Latex Polymer Networks *ACS Sust. Chem. Eng.*, **2018**, 6 (2), pp. 2780-2786. DOI: 10.1021/acssuschemeng.7b04462.
11. K. Kingsley, O. Shevchuk, Z. Demchuk, S. Voronov, A. Voronov The features of emulsion copolymerization for plant oil-based vinyl monomers and styrene *Industrial Crops and Products* **2017**, 109, pp. 274-280. DOI: 10.1016/j.indcrop.2017.08.043.
12. Z. Demchuk, Oleh Shevchuk, Ihor Tarnavchyk, Vasylyna Kirianchuk, Maria Lorenson, Ananiy Kohut, Stanislav Voronov, Andriy Voronov Free-Radical Copolymerization Behavior of Plant-Oil-Based Vinyl Monomers and Their Feasibility in Latex Synthesis *ACS Omega*, **2016**, 1 (6), pp. 1374–1382. DOI: 10.1021/acsomega.6b00308.
13. Z. Demchuk, Oleg Shevchuk, Ihor Tarnavchyk, Vasylyna Kirianchuk, Ananiy Kohut, Stanislav Voronov, Andriy Voronov Free Radical Polymerization Behavior of the Vinyl Monomers from Plant Oil Triglycerides *ACS Sustainable Chem. Eng.*, **2016**, 4 (12), pp. 6974–6980. DOI: 10.1021/acssuschemeng.6b01890.
14. Z. Demchuk, M. Savka, A. Voronov, O. Budishevskaya, V. Donchak, S. Voronov Amphiphilic cholesterol-containing polymers for drug delivery systems *Chemistry and Chemical Technology* **2016**, 10(4), pp. 561-570. DOI: 10.23939/chct10.04si.561.
15. Z. Demchuk, O.G. Budishevskaya, A.S. Voronov, V.B. Vostres, I.T. Tarnavchyk, M.Z. Savka, O. Yu. Zholobko, S.A. Voronov Synthesis of surface-active cholesteryl-containing copolymers based on poly (maleic anhydride-co-ethyltrioxyethylene methacrylate) *Polymer journal*, **2015**, V. 37, Iss. 3, pp. 299-305. DOI: 10.15407/polymerj.37.03.299.
16. Z. Demchuk, M.Z. Savka, V.B. Vostres, O.G. Budishevskaya, S.A. Voronov Surface-active cholesteryl-containing copolymers for solubilization of lipophilic substances *Bulletin of Lviv Polytechnic National University, Chemistry, substances technology and their applications*, **2015**, 812, pp. 425-432.
17. O. Zholobko, I.T. Tarnavchyk, A.S. Voronov, Z. Demchuk, O.G. Budishevskaya, A.M. Kohut, S.A. Voronov Formation of hydrogels based on chitosan and poly (ethylene glycol) disuccinates *Polymer journal*. **2014**, V. 36, Iss. 1, pp. 78-84.
18. O. Zholobko, I.T. Tarnavchyk, A.S. Voronov, Z. Demchuk, O.G. Budishevskaya, A.M. Kohut, S.A. Voronov Peculiarities of the interaction between glucosamine as monomer unit of chitosan macromolecules and poly (ethylene glycol) disuccinates *Polymer journal*. **2014**, V. 36, Iss. 2, pp. 162-175.
19. O. Zholobko, Z. Demchuk, M. Buk, V. Vostres, O. Budishevskaya, A. Voronov, S. Voronov Hydrogels based on chitosan succinates derivatives as dyes absorbents *Bulletin of Lviv Polytechnic National University, Chemistry, substances technology and their applications*, **2014**, 787, 366-373.
20. O. Zholobko, Z. Demchuk, V. Vostres, O. Budishevskaya, S. Voronov Hydrogels based on chitosan and poly (ethylene glycol) disuccinates for adsorption and release of the dyes *Proceedings of the VII International scientific-technical conference "Advance in Petroleum and Gas Industry and Petrochemistry"*, **2014**, pp. 305-313.

Conference Papers

1. Z. Demchuk, O. Zolobko, O. Budishevskaya, S. Voronov "Hydrogels based on chitosan and polyoxyethylene derivatives for drug delivery". Materials of the 5th Ukrainian Conference with international participation students and graduate students "Karasin's chemistry reading", pp.175-176, April **2013**, Kharkiv, Ukraine
2. Z. Demchuk, O. Khomenko, O. Kudina, A. Voronov, O. Budishevskaya, S. Voronov "Diesters of peromellitic acid - amphiphilic surfactants for solubilization hydrophobic substances ". Book of Abstracts of the "Lviv Chemical Readings" Conference, May **2013**, Lviv, Ukraine
3. Z. Demchuk, O. Budishevskaya, S. Voronov "Polyoxyethylene containing chitosan derivatives for the development of hydrogels". Book of Abstracts of the 71th Scientific and Technical Conference for students, June **2013**, Lviv, Ukraine
4. Z. Demchuk, O. Zholobko, I. Tarnavchyk, A. Voronov, A. Kohut Hydrogels based on chitosan and polyethylene glycol succinates interactions 16th JCF- Frühjahrssymposium (spring symposium), p. 174, March 26-29, **2014**, Jena, Germany
5. Z. Demchuk, O. Budishevskaya, A. Voronov, V. Vostres, Stanislav Voronov Cholesterol-containing amphiphilic copolymers based on maleic anhydride and ethylpolyoxyethylene methacrylate VIII Ukrainian-Polish Conference "Polymers of special applications", p. 36, October 1-4, **2014**, Bukovel, Ukraine
6. Z. Demchuk, O. Budishevskaya, S. Voronov, O. Zholobko, A. Voronov Cholesterol-containing copolymers based on maleic anhydride as solubilizers of lipophilic substances 17th JCF-Frühjahrssymposium (spring symposium), p. P1-079, March 25-28, **2015**, Munster, Germany
7. Z. Demchuk, I. Tarnavchyk, A. Popadyuk, A. Voronov Synthesis of vinyl monomer from soybean oil NDSU-KU Joint Symposium on Biotechnology, Nanomaterials and Polymers, October 24-25, **2015**, Fargo, ND
8. Z. Demchuk, I. Tarnavchyk, A. Popadyuk, A. Voronov Synthesis of bio-based copolymers via free radical polymerization of novel vinyl monomer from soybean oil 251st ACS National Meeting, 13th International Symposium on Biorelated Polymers, POLY Division March 13-17, **2016**, San Diego, CA
9. Z. Demchuk, A. Popadyuk, I. Tarnavchyk, S. Samanta, B. Chisholm, A. Voronov Soybean-based polymer surfactants for personal care application 251st ACS National Meeting, PMSE: Joint PMSE/POLY Poster Session March 13-17, **2016**, San Diego, CA
10. Z. Demchuk New Biobased Copolymers from Soybean Oil for Coatings Applications, American Coatings Conference, April 11-13, **2016**, Indianapolis, IN
11. Z. Demchuk, I. Tarnavchyk, A. Voronov Novel bio-based latexes from plant oil for coatings applications, 1st International Symposium on Materials from Renewables, July 18-19, **2016**, Fargo, ND
12. Z. Demchuk, I. Tarnavchyk, O. Shevchuk, V. Kirianchuk, A.S. Voronov, Plant oil-based acrylic monomers for free radical polymerization. 253rd ACS National Meeting, CELL: New Horizons in Sustainable Materials April 2-6, **2017**, San Francisco, CA
13. Z. Demchuk, I. Tarnavchyk, V. Kirianchuk, A.S. Voronov Synthesis of latexes from plant oil-based acrylic monomers. 253rd ACS National Meeting, Joint PMSE/POLY Poster session April 2-6, **2017**, San Francisco, CA
14. Z. Demchuk, I. Tarnavchyk, V. Kirianchuk, A. Voronov, Synthesis of plant oil-based latexes for coatings applications. ND EPSCoR 2017 State Conference, April 12, **2017**, Fargo, ND
15. Z. Demchuk, K. Kingsley, O. Shevchuk, I. Tarnavchyk, V. Kirianchuk, A. Kohut, S. Voronov, A. Voronov. Free radical polymerization of monomers based on plant oils. 2017 American Oil Chemists Society Annual meeting, April 30 – May 3, **2017**, Orlando, FL
16. Z. Demchuk, I. Tarnavchyk, O. Shevchuk, V. Kirianchuk, S. Voronov, A. S. Voronov Free radical polymerization of acrylic monomers from plant oils. Polymer Chemistry, ACS Great Lakes Regional meeting, June 27-30, **2017**, Fargo, ND
17. Z. Demchuk, I. Tarnavchyk, O. Shevchuk, V. Kirianchuk A. Voronov Feasibility of Plant Oil-Based Acrylic Monomer in Latex Synthesis NDSU-KU Joint Symposium on Biotechnology, Nanomaterials and Polymers, October **2017**, Fargo, ND
18. Z. Demchuk, I. Tarnavchyk, O. Shevchuk, V. Kirianchuk, S. Voronov, A. Voronov Plant Oil-Based Acrylic Monomers for Free Radical Polymerization and Their Feasibility for Latex Synthesis, The Fiber Society Fall 2017 Conference, 2nd International Symposium on Materials from Renewables, November 7-10, **2017**, Athens, GA
19. Z. Demchuk, K. Kingsley, O. Shevchuk, I. Tarnavchyk, V. Kirianchuk, A. Kohut, S. Voronov, A. Voronov, High Biobased Content Latexes from Plant Oil-Based Vinyl Monomers in Miniemulsion, 255th ACS National Meeting and Expo, March 18-22, **2018**, New Orleans, LA
20. Z. Demchuk, A. Kohut, S. Voronov, A. Voronov The Effect of Plant Oil-Based Monomer Structure on Properties of Latexes Synthesized in Miniemulsion Polymerization, ND EPSCoR State Conference 2018, April 17, **2018**, Grand Forks, ND
21. Z. Demchuk, A. Kohut, S. Voronov, A. Voronov The Effect of Unsaturation in Plant Oil-Based Monomers on Properties of High Biobased Content Latexes Synthesized in Miniemulsion Polymerization American Coatings Conference, April 9-11, **2018**, Indianapolis, IN
22. Z. Demchuk, A. Kohut, I. Tarnavchyk, S. Voronov, A. Voronov The Effect of Plant Oil-Based Monomer Structure on Latex Properties Synthesized in Miniemulsion Polymerization, American Oil Society Conference, May 7-9, **2018**, Minneapolis, MN

23. Z. Demchuk, V. Kirianchuk, I. Tarnavchyk, O. Shevchuk, A. Kohut, S. Voronov, A. Voronov The Investigation of the Effect of Plant Oil-Based Monomer Structure on Latex Properties Synthesized in Miniemulsion Polymerization, National Graduate Research Polymer Conference, June 10-12, Minneapolis, MN
24. Z. Demchuk, O. Shevchuk, V. Kirianchuk, S. Voronov, A. Voronov Plant Oil-Based Latexes with High Biobased Content Synthesized in Miniemulsion Polymerization 3rd International Symposium “Materials from Renewables”, July 17-18, **2018**, Fargo, ND
25. Z. Demchuk, K. Kingsley, A. Voronov, V. Kirianchuk, Y. Polunin, O. Shevchuk, A. Kohut, S. Voronov, Monomers and Polymers from Plant/Vegetable Oils, 2nd EastWest Chemistry Conference, October 10-12, **2018**, Lviv, Ukraine
26. Z. Demchuk, V. Kirianchuk, O. Shevchuk, S. Voronov, A. Voronov Plasticizing Behavior of Plant Oil-Based Acrylic Monomers and the Effect of Their Unsaturation on Latex Properties NDSU-KU Joint Symposium on Biotechnology, Nanomaterials and Polymers, November 1-3, **2018**, Kagoshima, Japan.
27. Z. Demchuk, V. Kirianchuk, O. Shevchuk, S. Voronov, A. Voronov Influence of Monomers Structure on Properties of Plant Oil-Based Latex Copolymers Center of Bioplastics and Bio composites Meeting, November 12-14, **2018**, Fargo, ND
28. Z. Demchuk, V. Kirianchuk, O. Shevchuk, S. Voronov, A. Voronov Influence of Monomers Structure on Properties of Plant Oil-Based Latex Copolymers ND EPSCoR Translation Summit, February 25-26, **2019**, Fargo, ND
29. Z. Demchuk, O. Shevchuk, V. Kirianchuk, A. Kohut, S. Voronov, A. Voronov The Effect of Unsaturation on Properties of High Biobased Content Plant Oil-Based Latexes and Latex Materials 10th Workshop on Fats and Oils as Renewable Feedstock for the Chemical Industry, March 17-19, **2019**, Karlsruhe, Germany
30. Z. Demchuk, V. Kirianchuk, O. Shevchuk, S. Voronov, A. Voronov Influence of Monomers Structure on Properties of Plant Oil-Based Latex Copolymers, ND EPSCoR Annual Conference, March 27, **2019**, Fargo, ND
31. Z. Demchuk, Li, J.W.S., H. Eshete, S. Caillol, A. Voronov Influence of Plant Oil-Based Monomers Structure on Properties of Latex Copolymers Thereof, 257th ACS National Meeting and Expo, March,31 – April,4, **2019**, Orlando, FL
32. Z. Demchuk, K. Kingsley, V. Kirianchuk, A. Kohut, O. Shevchuk, S. Voronov, A. Voronov Monomers and Polymers from Plant Oils, 257th ACS National Meeting and Expo, March,31 – April,4, **2019**, Orlando, FL
33. Z. Demchuk, V. Kirianchuk, A. Kohut, S. Voronov, A. Voronov Influence of Plant Oil Unsaturation on Properties of Latexes Synthesized via Miniemulsion Polymerization, American Coatings Tech Conference, April 8-10, **2019**, Cleveland, OH
34. Z. Demchuk, V. Kirianchuk, A. Kohut, S. Voronov, A. Voronov Features of Plant Oil-Based Monomers in Latex Synthesis via Miniemulsion Polymerization, 2019 Coatings and Polymeric Materials IAB Meeting, April 16-17, **2019**, Fargo, ND
35. Z. Demchuk, K. Kingsley, V. Kirianchuk, A. Kohut, O. Shevchuk, S. Voronov, A. Voronov Features and Properties of Latexes Copolymers from Plant Oil-Based Acrylic Monomers, Polymers in Life Sciences, May, 14-15, **2019**, Philadelphia, PA
36. Z. Demchuk, K. Kingsley, V. Kirianchuk, A. Kohut, O. Shevchuk, S. Voronov, A. Voronov Effect of plant oil-based acrylic monomers on features and properties of latex copolymers 42nd Northeast Regional Meeting of the ACS, , June 23 – 26, **2019**, Saratoga, NY
37. Z. Demchuk, G. Pourhashem, A. Voronov. Life cycle environmental impact considerations in the design of soybean oil-based paint monomers 10th International Conference on Industrial Ecology, July 7-11, **2019**, Beijing, China
38. Z. Demchuk, S. Choudhary, Anne-Sophie Mora, A. Voronov, S. Caillol The Synthesis of Latex Materials Derived from Fully Renewable Monomers NDSU-KU Joint Symposium on Biotechnology, Nanomaterials and Polymers, October 3-5, **2019**, Fargo, ND
39. Z. Demchuk, S. Choudhary, Anne-Sophie Mora, A. Voronov, S. Caillol The Feasibility of Latex Materials Synthesis Made from Fully Renewable Monomers 4th International Symposium “Materials from Renewables”, October 9-10, **2019**, Athens, GA
40. Z. Demchuk, N. Wu, Gh. Pourhashem, A. Voronov Life Cycle Environmental Impact Considerations in the Design of Soybean Oil-Based Acrylic Monomers 4th International Symposium “Materials from Renewables”, October 9-10, **2019**, Athens, GA
41. Z. Demchuk, S. Choudhary, Anne-Sophie Mora, A. Voronov, S. Caillol Sustainable Synthesis of Latex Materials from Fully Renewable Plant-Based Monomers 4th International Symposium “Materials from Renewables”, February 3-6, **2020**, Long Beach, CA