

**INSTITUTE FOR POLYMER RESEARCH (IPR)
UNIVERSITY OF WATERLOO
WATERLOO, ONTARIO N2L 3G1**

NEWSLETTER 2022

Table of Content

1. NOTE FROM PROFESSOR JEAN DUHAMEL, IPR DIRECTOR	1
2. ANNUAL IPR SYMPOSIUM	2
3. IPR INDUSTRIAL MEMBERS	2
4. IPR PREPRINTS	2
5. RESEARCH PROGRAMS	2
6. RECENTLY GRADUATED GRADUATE STUDENTS	2-3
7. ACADEMIC MEMBERS OF THE INSTITUTE FOR POLYMER RESEARCH	3
8. MEMBER COMPANIES – 2021	4
9. STUDENT AWARDS	4
10. FACULTY AWARDS	4-5
11. FULL REFEREED JOURNAL PAPERS	5-14
12. CONFERENCE PRESENTATIONS/INVITED SEMINAR	15-17
13. PATENTS/MAJOR TECHNICAL REPORT/CHAPTERS IN BOOKS.....	17-18
14. OTHER HIGHLIGHTS OF THE YEAR.....	18-19
15. APPENDIX 1	20-22
16. APPENDIX 2	23
17. APPENDIX 3	24-27

February 2022

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1. NOTE FROM PROFESSOR JEAN DUHAMEL, IPR DIRECTOR

While the first half of 2022 was still marked by Covid, it seems that things are improving significantly and that we are finally returning to a more normal operation. I am certainly feeling much more confident now that the 2023 IPR Symposium will be held in-person! Nevertheless, the last 44th IPR Symposium had to be held remotely for the third time in a row on May 4th, 2022. Despite the last-minute pivot, the symposium was well attended and provided a nice overview of the exciting polymer research conducted at Waterloo with 21 student presenters. We also had two keynote speakers with Prof. John R. Dutcher from the University of Guelph delivering a fascinating talk on the *“Stiffness and Deformability of Soft Hydrated Polysaccharide Nanoparticles”* obtained from glycogen and Dr. Adam Polit from PolyAnalytik based in London providing a thorough review about *“Innovative Analytical Solutions for Comprehensive Polymer Characterization”*. Our two 2021 IPR award winners gave also exciting talks. They were Junjie Yin from Physics under the supervision of Prof. Jamie Forrest who gave a talk on *“Surface Relaxation of Vapor Deposited Polystyrene Glasses”* and Yebin Lee from Prof. Michael Tam’s laboratory whose presentation was entitled *“One-Pot Green Synthesis of Cellulose Nanocrystal Gold Nanoshell”*. Despite being held on-line once more, many colleagues from Academia and Industry were able to join the IPR Symposium remotely.

The experience gained from the successful remote delivery of the last three IPR Symposia will be harnessed in future symposia, which will be offered in a hybrid mode combining the ease of attending the symposium remotely with the stronger interactions offered by an in-person venue. In particular, this strategy will be implemented in the 2023 IPR Symposium, where presenters will be given the possibility to give talks in-person and remotely in front of a mixed audience of remote and in-person attendees.

Beside the work conducted around the organization of the symposium, another activity coordinated by the IPR is the IPR Student Presentation Series. In 2022, Franklin Frasca from the Duhamel group gave a thorough overview about *“Polymeric Oil Additives: Their Chemistry and Applications”* and Weinan Zhao from Prof. Michael Tam’s group gave a nice presentation on *“Superhydrophobic surface with tunable nanoscale hydrophilicity for water harvesting”*. The IPR Student Presentations are always very well attended and trigger interesting discussions among attendees.

The IPR members also continue to distinguish themselves for their contributions to the publication of important and novel achievements in polymer research through their editorial responsibilities. Profs. Penlidis is serving on the editorial board of *Polymer-Plastics Techn. and Eng., Macromol. React. Eng., and Processes*. Prof. Tam is an associate editor for *ACS Sustain. Chem. Eng.* Prof. Tzoganakis serves on the editorial board of *Adv. Polym. Technol.* Prof. Zhao became a member of the Editorial Board of *Nanomanufacturing* and is a co-guest editor for a special issue in MDPI *Polymers* entitled *“Composite Hydrogels Toward Next Generation Functional Materials and Devices”*. Prof. Jean Duhamel is an editorial board member of *Polymers* and is a guest editor for the special issue in *Polymers* entitled *“Current Directions and Innovations in Fluorescence Techniques for Characterization of Polymers and Polymeric Materials”*.

Before closing this editorial, I look forward to seeing you at the next and 45th IPR Symposium on May 3rd, 2023. Prof. Mario Gauthier, who retired last year from UW, and Dr. Jason Dockendorff from 3M will be our two keynote speakers. As you are all aware, the IPR Symposium represents the cornerstone of the IPR activities for promoting the most exciting polymer research and we will be delighted to seeing you in person or remotely!

2. ANNUAL IPR SYMPOSIUM

The 44th Annual IPR Symposium will be held May 3rd, 2023. A schedule and registration forms will be circulated electronically.

Many thanks to all who participated in the 2022 Symposium. IPR received very positive feedback regarding the topics covered. The 2022 program and the list of industrial participants are attached (Appendix 1).

3. IPR INDUSTRIAL MEMBERS

An up-to-date list of our current industrial members is attached (Appendix 2).

4. IPR PREPRINTS

During 2022, the IPR office sent out 27 preprints to our members (Appendix 3).

5. RESEARCH PROGRAMS

We have more than 90 research personnel (excluding faculty) involved in polymer research at the University of Waterloo. Industrial members may find it interesting to keep up to date with the various research projects that are underway.

6. RECENTLY GRADUATED STUDENTS

J. Duhamel

MSc	Chem	Lulic, Kristijan	Probing the Self-Assembly of Oligophenylenevinylene-Labeled Oligoquinolenes in Solution by Fluorescence Anisotropy
MSc	Chem	Little, Hunter	Calibrating the Long Range Backbone Dynamics of Polymers in Solution Using Two Different Models
PhD	Chem	Ba Salem, Abdullah	Probing the Interactions between Pyrene-labeled Gemini Surfactants and DNA by Fluorescence

X. Feng

PhD	ChE	Li, Zhelun.	Polydopamine-based thin film composite membranes for pervaporative concentration of potassium acetate solution
PhD	ChE	Wang, Han	Development of oleophilic membranes for VOC/N ₂ separation
MASc	ChE	Chen, Mike	Alkaline Treatment of Chitosan Membranes

Y. Li

PhD	ChE	Xiguang, G.	Using Polymers to Improve the Performance of Sulfur and Organic Cathodes
MASc	ChE	Polena, J.	Hemi-Isoindigo Polymers and Oligomers for Temperature Sensing Applications
MASC	ChE	Afzal, D.	Study of the Effects of Long Carbamate Chain on Indigoid-Based Donor -Acceptor Polymers for Organic Electronic Applications

T. Mekonnen

MASc	ChE	Quosai, P.	Improving leach bedreactor design for medium-chain fatty acid production from food waste at room-temperature.
MASc	ChE	Guiao, K.	Green thermo-mechano-chemical processing for the Recovery of lignocellulosic Biomass Components
PhD	ChE	Jubenville, D.	Wood-plastics composites based on recycled polyolefins

M. Tam

PhD	ChE	Islam, S.	Functional Polysaccharide Nanomaterials (PS-NMs) for the reduction of elevated serum cholesterol & progressive diet-induced obesity (DIO): A 'novel' application of PS-NMs
PhD	ChE	Xu, J.	Development of Nanogel Templated and Sustainable Nanomaterials for Environmental Applications
PhD	ChE	Ataeian, P.	Application Of Cellulose Nanocrystals (CNCs) in Emulsified Bitumen
PhD	ChE	Lee, Y.	Design of Functional Coating on Cellulose Nanocrystals for Advanced Applications

C. Tzoganakis

MASc	ChE	Guiao, K.	Green thermo-mechano-chemical processing for the Recovery of lignocellulosic Biomass Components
PhD	ChE	Jubenville, D.	Wood-plastics composites based on recycled polyolefins

B. Zhao

MASc	ChE	Liang, M.	Nanocrystal cellulose enhanced waterborne polyurethane composite
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7. ACADEMIC MEMBERS OF THE INSTITUTE FOR POLYMER RESEARCH

Professors:

R. Dhib	Chem. Eng.	Ryerson
T.A. Duever	Chem. Eng.	Ryerson
J. Duhamel, Director,	Chemistry	Waterloo
X. Feng	Chem. Eng.	Waterloo
J. Forrest	Phys. Astro.	Waterloo
M. Gauthier (retired),	Chemistry	Waterloo
Y. Li	Chem. Eng.	Waterloo
N. McManus	Chem. Eng.	Waterloo
T. Mekonnen	Chem. Eng.	Waterloo
A. Penlidis	Chem. Eng.	Waterloo
D. Schipper	Chemistry	Waterloo
L. Simon	Chem. Eng.	Waterloo
M. Tam	Chem. Eng.	Waterloo
C. Tzoganakis	Chem. Eng.	Waterloo
E. Vivaldo-Lima	Chem. Eng.	UNAM, Mexico
X. Wang	Chemistry	Waterloo
B. Zhao	Chem. Eng.	Waterloo

For a brief description of research interests and projects, along with contact information, please visit the following web link: www.uwaterloo.ca/institute-polymer-research/

8. MEMBER COMPANIES—2022

Currently, there are **7 member companies**: (refer also Appendix 3)

Afton

Compuplast Canada Inc.

Lanxess Inc.

Mondelez Inc.

Synothomer Inc.

PolyVision, The Netherlands

Princeton Polymer Consultants, USA

9. STUDENT AWARDS

X. Feng

Jinxuan Zhang, WIN Nano Fellowship

Iris Samputu, IBET Momentum Fellowship

Y. Li

Scott Flynn, Canada Graduate Scholarships – Master's program – NSERC (May 2021-April 2022)

Yi Yuan, OMNOVA/Synthomer Grant

E. Vivaldo-Lima

Honor mention, 2022 SPM Award to the best thesis on Polymers, PhD level, granted by the Mexican Polymer Society (SPM) to Porfirio López-Domínguez, October 21, 2022.

M. Tam

Lian Han - WIN Fellowship

Weinan Zhao - WIN Fellowship

Yi Wang - WIN Fellowship

10. FACULTY AWARDS

E. Vivaldo-Lima

Awardee of the “2022 Recognition to the Academic Merit”, Region VIII (Mexico City and Metropolitan area of the Valley of Mexico), granted by the National Association of Engineering Faculties and Schools (ANFEI), Mexico, October 11, 2022.

B. Zhao

Professor Boxin Zhao awarded a University of Waterloo Endowed Chair in Nanotechnology

C. Tzoganakis

En-Hui Yang Engineering Research Innovation Award, University of Waterloo (2022)

Presented each year to tenure or tenure-track faculty members in the faculty of Engineering in recognition of outstanding research accomplishments, innovative ideas, and dedication to Waterloo Engineering's research.

T. Mekonnen

Nanocrystal cellulose enhanced waterborne polyurethane composite

11. FULL REFEREED JOURNAL PAPERS

J. Duhamel

Casier, R.; Duhamel, J. Pyrene Excimer Formation (PEF) and its Application to the Study of Polypeptides Dynamics. *Langmuir* 2022, 38, 3623-3629.

Gholami, K.; Frasca, F.; Duhamel, J. Probing the Interactions between Pour Point Depressants (PPDs), Viscosity Index Improvers (VIIs), and Wax in Octane Using Fluorescently Labeled PPDs. *Can. J. Chem.* 2022, 100, 688-696.

Ba Salem, A.; Gong, R.; Duhamel, J. Characterization of the Interactions between Unassociated Cationic Pyrene-Labeled Gemini Surfactant and Anionic Sodium Dodecyl Sulfate. *Langmuir* 2022, 38, 7484-7495.

Kim, D.; Duhamel, J. Cluster Size of Amylopectin and Nanosized Amylopectin Fragments Characterized by Pyrene Excimer Formation. *Polymers* 2022, 14, 3418.

Frasca, F.; Duhamel, J. End Group Analysis of Polyisobutylene Succinic Anhydride (PIBSA) Carried out with Pyrene Excimer Fluorescence. *Ind. Eng. Chem. Res.* 2022, 61, 14747-14759.

Kim, D.; Duhamel, J. Interior of Glycogen Probed by Pyrene Excimer Fluorescence. *Carbohydr. Polym.* 2023, 299, 120205.

X. Feng

M. Khaleel, Z. He, G.N. Karanikolos, X. Feng, K. Wang (2022), The concentration dependent permeation properties of binary CO₂ gas mixtures through carbon molecular sieve membrane, *International Journal of Greenhouse Gas Control*, 121, 103778.

S. Ali, I.A. Shah, I. Ihsanullah, X. Feng (2022), Nanocomposite membranes for organic solvent nanofiltration: Recent advances, challenges, and prospects, *Chemosphere*, 308, 136329.

X. Cao, K. Wang, X. Feng (2022), Incorporating ZIF-71 into poly(ether-block-amide) (PEBA) to form mixed matrix membranes for enhanced separation of aromatic compounds from aqueous solutions by pervaporation, *Separation and Purification Technology*, 300, 121924.

Z. Li, K. Hu, X. Feng (2022), Co-depositing polyvinylamine and dopamine to enhance membrane performance for concentration of KAc solutions via sweeping air pervaporation, *Journal of Membrane Science*, 656, 120664.

X. Cao, L. Qiu, X. Feng (2022), Permeability, solubility, and diffusivity of aniline in poly(ether-b-amide) membranes pertaining to aniline removal from aqueous solutions by pervaporation and sorption, *Journal of Membrane Science*, 642, 120006.

W. Hu, S. Lin, Y. Cao, X. Feng, Q. Pan (2022), Preparation and characterization of attapulgite supported phase change energy storage materials, *RSC Advances*, 12, 15180-15189.

C. Du, X. Zhao, J.R. Du, X. Feng, H. Yang, F. Cheng, M.E.A. Ali (2022), A field study of desalination of high-salinity surface brackish water via an RO-NF hybrid system, *Chemical Engineering Research & Design*, 182, 133-144.

B. Zhang, X. Feng (2022), Assessment of pervaporative concentration of dairy solutions vs ultrafiltration, nanofiltration and reverse osmosis, *Separation and Purification Technology*, 292, 120990.

Y. Yang, S. Lin, X. Feng, Q. Pan (2022), Synthesis and characterization of core-shell bottlebrush polymers via controllable polymerization, *ChemistrySelect*, 7, e202201040.

C. Du, J.R. Du, X. Feng, F. Du, F. Cheng, M.E.A. Ali (2022), Pervaporation-assisted desalination of seawater reverse osmosis brine, *Separation and Purification Technology*, 290, 120820.

L. Cao, Y. Zhang, L. Ni, X. Feng (2022), A novel loosely structured nanofiltration membrane bioreactor for wastewater treatment: Process performance and membrane fouling, *Journal of Membrane Science*, 644, 120128.

Y. Wang, T. Xiao, Z. Zhang, X. Feng (2022), Extraction and concentration of glutathione from yeast by membranes, *Canadian Journal of Chemical Engineering*, 100, S195-S204.

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Nanoscale surface roughness induced by poor solvents on polymer film surfaces, T. Trumpour, J.A. Forrest, *Eur. Phys. J. E* 45, 85 (2022)

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M. Gauthier

B. O. Ode Boni, B. M. Bakadia, A. R. Osi, Z. Shi, H. Chen, M. Gauthier, G. Yang. Immune Response to Silk Sericin-Fibroin Composites: Potential Immunogenic Elements and Alternatives for Immunomodulation. *Macromol. Biosci.* **2022**, 22(1), 2100292.

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- Mahi, M. Gauthier, N. Hadjichristidis.
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- S. Manan, M. W. Ullah, M. Ul-Islam, Z. Shi, M. Gauthier, G. Yang.
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- Z. Cheng, Y. Yang, P. Pan, J. Li, L. Zhang, J. Qin, H. Wang, S. Cai, L. Wang, M. Gauthier.
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Faming Zhuanli Shenqing **2022**, CN 115304769 A 20221118 (Chinese patent application).

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Faming Zhuanli Shenqing **2022**, CN 115304758 A 20221108 (Chinese patent application).

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Faming Zhuanli Shenqing **2022**, CN 115322352 A 20221111 (Chinese patent application).

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Preparation of Bio-based Copolyester Based on 4-Hydroxybenzaldehyde for Coating.
Faming Zhuanli Shenqing **2022**, CN 115368541 A 20221122 (Chinese patent application).

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Faming Zhuanli Shenqing **2022**, CN 115433348 A 20221206 (Chinese patent application).

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A Kind of Preparation Method of Pyrazine of Green New and for Pharmaceutical Intermediate Synthesis.
Faming Zhuanli Shenqing **2022**, CN 115557905 A 20230103 (Chinese patent application).

Y. Li

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Jiang, Y.; Liu, H.; Li, X.; Yuan, Y.; Wang, J.; Cui, B.; Li, Y. Alkylloxime-Substituted Thiophene-Based Wide-Band-Gap Polymer Donor Achieving a High Short Circuit Current Density of 30 MA Cm⁻² in Organic Solar Cells. *Chem. Mater.* 2022, 34 (9), 4232–4241. <https://doi.org/10.1021/acscemmater.2c00929>.

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T. Mekonnen

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M. Tam

Chen, L.; Yu, H.; Zhou, W.; Tam, K.C., One-Step Acid Induced Confined Conversion of Highly Oriented 2 and Well-Defined Graphitized Cellulose Nanocrystal: Potential 3 Advanced Energy Material, *ACS Sustainable Chemistry & Engineering*, (2022) Accepted

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Ouyang, Z.; Wang, C.; Xu, D.; Yu, H.; Zhou, Y.; Mu, M.; Ge, D.; Miao, Z.; Tam, K.C., Lightweight Nanofibrous Crosslinked Composite Aerogels with Controllable Shapes and Superelasticity for Pressure Sensors, *Macromolecular Materials and Engineering*, (2022), 307, 2100834

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E. Vivaldo-Lima

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Gabriel Jaramillo-Soto, Samuel Alejandro Sarracino-Silva and Eduardo Vivaldo-Lima*, Kinetics of polymer network formation by nitroxide-mediated radical copolymerization of styrene/divinylbenzene in super-critical carbon dioxide, *Processes*, 10(11), 2386, 2022; <https://doi.org/10.3390/pr10112386>; 13 pages.

Juan Carlos Morales-Huerta, Oscar Hernández-Meléndez, Fernando Iván Garcés-Sandoval, Carmina Montiel, Martín Guillermo Hernández-Luna, Octavio Manero, Eduardo Bárzana and Eduardo Vivaldo-Lima*, “Modeling of pretreatment and combined alkaline and enzymatic hydrolyses of blue agave bagasse in corotating twin-screw extruders”, *Macromol. React. Eng.*, 16(3), 2100059, 2022; DOI: 10.1002/mren.202100059; 16 pages.

Porfirio López-Domínguez, Nathalie Michelle Carranco-Hernández, and Eduardo Vivaldo-Lima*, “Kinetic modeling of ring opening polymerization of lactones under microwave irradiation”, *Macromol. React. Eng.*, 16(3), 2100044, 2022, DOI: 10.1002/mren.202100044; 12 pages.

José Alfredo Tenorio-López, Juan José Benvenuta-Tapia*, Norma García-Navarro, Eduardo Vivaldo-Lima*, Pascale Champagne, and Enrique Saldívar-Guerra*, “Mathematical Description of the RAFT Copolymerization of Styrene and Glycidyl Methacrylate using the Terminal Model”, *Polymers*, 14(7), 1448, 2022; 18 pages; DOI: 10.3390/polym14071448.

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X. Wang

Synthesis and self-assembly of (C₅H₅)Fe(CO)₂ (Fp)-Based organometallic macromolecules

Wang, XS; Lo, PH, 2022, Polymer, 245, Article Number124588, DOI10.1016/j.polymer.2022.124588

The effect of C-X (alkyl groups) on the migration insertion polymerization (MIP) of (P)FpC(X) [(P)Fp = (PPh₂(CH₂)₃Cp)Fe(CO)₂]

Lo, PH; Wang, XS, 2022, Polymer, 242, Article Number124574, DOI10.1016/j.polymer.2022.124574

The effect of hydration and dehydration on the conformation, assembling behavior and photoluminescence of PBLG

Liu, Z; Shi, XJ; Shu, WC; Qi, S; Wang, XS; He, XH, 2022, Soft Matt, 18, Page4396-4401, DOI10.1039/d2sm00344a

Effect of Hydrophobic Hydration on the Self-Assembling Behavior of Poly (L-Lactide) Homopolymers with an Ionic End Group

Liu, Z.; Shi, XJ; Shu, WC; Qi, S; He, XM; Wang, XS; He, XH, 2022, Macromolecules, 55, Page8892-8898.

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Chen, J; Zheng, LL; Ji, XH; Wen, J; Wang, CL; Zhu, LP; Sun, B; Wang, XS; Zhu, MF, 2022, J. Phys. Chem. B 126, Page1334-1340, DOI10.1021/acs.jpcc.1c10305

B. Zhao

Jian Sun, Lukas Bauman, Li Yu, Boxin Zhao, "Bioinspired untethered soft robots climbing on walls and ceilings" Cell Reports Physical Science [IF=7.932], Accepted Dec 20, 2022

Aleksander Cholewinski, Eugenia Dadzie, Cassandra Sherlock, William Anderson, Trevor C. Charles, Komal Habib, Steven Young, Boxin Zhao, "A critical review of microplastic degradation and material flow analysis towards a circular economy", Environmental Pollution [IF=9.988], 315:120334, 2022

A-Reum Kim, Sushanta K. Mitra†, Boxin Zhao†, "Capillary pressure mediated long-term dynamics of thin soft films", Journal of Colloids and Interfacial Science [IF=9.965], 628: 788-797, 2022

Cancan Shan, Mingda Che, Aleksander Cholewinski, Joshua Kunihiro, Evelyn K.F. Yim, Rongxin Su, *, Boxin Zhao*, "Adhesive Hydrogels Tailored with Cellulose Nanofibers and Ferric Ions for Highly Sensitive Strain Sensors" Chemical Engineering Journal [IF = 16.744], 450:138256, 2022

Minghui Liu*, Lukas Bauman*, Christiane Lourenco Nogueira, Marc G. Aucoint†, William A. Anderson†, Boxin Zhao†, "Antimicrobial Polymeric Composites for High-touch Surfaces in Healthcare Applications" Current Opinion in Biomedical Engineering, [IF=3.227] 22: 100395, 2022

Guangwei Hu, Shaohui Lin, Boxin Zhao, Flora Ng, Qinmin Pan, "Synthesis of Styrene-Norbornene Diblock Copolymers via Ring-Opening Metathesis Polymerization and Nitroxide-Mediated Radical Polymerization" European Polymer Journal [IF=4.598], 111085, 2022

13. CONFERENCE PRESENTATIONS/INVITED SEMINARS

J. Duhamel

J. Duhamel, Characterization of the Structure and Dynamics of Complex Macromolecules in Solution with Pyrene Excimer Formation. Duhamel, J. Instituto de Investigaciones en Materiales, UNAM, Mexico, March 24th, 2022. (held remotely)

X. Feng

X. Feng, Gas separation by membranes based on pressure swing permeation, presented at School of Chemistry and Chemical Engineering, Beijing Institute of Technology, Dec 16, 2022.

X. Feng, Gas separation by membranes based on cyclic pressure swing permeation, Invited Keynote at the 13th World Filtration Congress, San Diego, CA, Oct. 5 - 9, 2022

X. Feng, Transport properties pertaining to pervaporation, perstraction and sorption for removal of high boiling organic contaminants from water, presented at McMaster University, March 3, 2022.

M. Gauthier

M. Gauthier, Controlled Architecture Polymers: What, Why, and How? 39th Canadian High Polymer Forum, August 2022, Gananoque, ON.

M. Gauthier, Chitosan Grafted with Thermoresponsive Poly(di(ethylene glycol) Methyl Ether Methacrylate) for Cell Culture, 30th International Materials Research Conference, August 2022, Cancún, México.

M. Gauthier, Controlled Architecture Polymers: What, Why, and How?, International Conference on Polymers and Advanced Materials (Polymat), October 2022, Huatulco, Mexico.

D. Schipper

D. Schipper, From Waste Plastic to Construction Magic. Waterloo Institute for Nanotechnology Pitches and Demos. University of Waterloo, Waterloo, Ontario

D. Schipper, Pi-functional Materials Enabled by Synthetic Advances. Summer Organic Chemistry Conference on Everybody's Research St. John's, Newfoundland, Canada

D. Schipper, Dehydration Polymerization and N-Oxide S-O Chalcogen Bonding for Conjugated Organic Materials. 29th International Symposium on the Organic Chemistry of Sulfur, Guelph, Canada

M. Tam

Tam, K.C., Cellulose nanocrystals – Synthesis, Properties and Applications, Technical University of Liberec, Liberec, Czech Republic, 21 Dec 2022

Tam, K.C., Innovation in Sustainable Nanomaterials for Advanced Engineering Applications, Technical University of Liberec, Liberec, Czech Republic, 19 Dec 2022

Tam, K.C., How to Write a Research Journal Article: Tips and General Advice, Technical University of Liberec, Liberec, Czech Republic, 16 Dec 2022

Tam, K.C., Innovation in Sustainable Nanomaterials for Advanced Engineering Applications. Invited talk at the Leaders at the Leading-Edge seminar series, Chemical Engineering, University of Toronto, Toronto, Ontario 12 Oct 2022

Tam, K.C., Innovation in Sustainable Nanomaterials for Advanced Engineering Applications, University of Manitoba, Winnipeg, Manitoba, 29 Aug 2022

Tam, K.C., Innovation in Sustainable Nanomaterials for Advanced Engineering Applications, University of Regina, Regina, Saskatchewan, 26 Aug 2022

Tam, K.C., Innovation in Sustainable Nanomaterials for Advanced Engineering Applications, University of Saskatchewan, Saskatoon, Saskatchewan, 25 Aug 2022

Tam, K.C., Innovation in Sustainable Nanomaterials for Advanced Engineering Applications, University of Calgary, Calgary, Alberta, 22 Aug 2022

Tam, K.C., How to Write a Research Journal Article: Tips and General Advice, University of Calgary, Calgary, Alberta, 22 Aug 2022

Tam, K.C., Innovation in Sustainable Nanomaterials for Advanced Engineering Applications, University of Victoria, Victoria, British Columbia, 20 May 2022

Tam, K.C., Innovation in Sustainable Nanomaterials for Advanced Engineering Applications, Simon Fraser University, Burnaby, British Columbia, 12 May 2022

Tam, K.C., Innovation in Sustainable Nanomaterials for Advanced Engineering Applications, University of British Columbia, Vancouver, British Columbia, 9 May 2022

A. Penlidis

Scott, A.J., L. Romero-Zeron and A. Penlidis (2022). Designed polymers for EOR: From polymerization kinetics to application performance. MACRO2022, 49th World Polymer Congress (IUPAC), Winnipeg, Manitoba, Canada; July 17-21, 2022; refereed abstract conference.

E. Vivaldo-Lima

Contribuciones a la Ciencia y Tecnología de Síntesis y Degradación de Macromoléculas (Contributions to the Science and Technology of Synthesis and Degradation of Macromolecules), online invited seminar, Monthly Academic Seminar Series of the Department of Chemical Engineering of UNAM's Faculty of Chemistry, Facultad de Química, Universidad Nacional Autónoma de México, April 21 2022; Links:

<https://www.facebook.com/diqfq.oficial/videos/530637771794630>;

<https://drive.google.com/file/d/1CHMv7n9beKdva7zK6LONHgudRtPeiPuA/view?usp=sharing>

Modeling of superacid catalyzed polyhydroxyalkylation of modified isatin and biphenyl (invited oral presentation to E. Vivaldo), Juan Enrique Romero-Hernández, Alfredo Cruz-Rosado, Joaquín Palacios-Alquisira, Mikhail G. Zolotukhin, Eduardo Vivaldo-Lima, 6th International Conference on Catalysis and Chemical Engineering (CCE 2022), San Francisco, California, USA, February 22-26, 2022.

B. Zhao

Lukas Alexander Bauman, Boxin Zhao, 3D printable multifunctional hydrogel materials towards digital health, Canadian Chemical Engineering Conference, Vancouver, Oct 22-26, 2022

A-Reum Kim, Sushanta Mitra, Boxin Zhao, Interfacial dynamics of viscoelastic solids, Canadian Chemical Engineering Conference, Vancouver, Oct 22-26, 2022

Yuan Wei, Lu Yin, Alek Cholewinski, A-Reum Kim, Lukas Bauman, Gang Chen, and Boxin Zhao, Adhesive and Anti-Fouling “Janus” Hydrogel-Integrated Human-Machine Interfaces for Bioelectronics, 2022 Canadian Chemical Engineering Conference, Vancouver, Oct 22-26, 2022

Lukas Alexander Bauman, 3D printing personalized medical hydrogel mask 2022 GLOBAL SUMMIT Nanotechnology for a Healthier and Sustainable Future, Waterloo, ON, Aug 10-11, 2022

Boxin Zhao, Lukas Bauman, Smart Polymers and Bio-nanomaterials for Advanced Sustainable Manufacturing WIN Seminar, March 23, 2022

Boxin Zhao, Bioadhesion and Functional Polymers for Sustainable Advanced Manufacture, L’OREAL, OPEN MATERIALS SCIENCE, Research & Innovation Webinar, Jan 6, 2022

14. PATENTS/MAJOR TECHNICAL REPORT/CHAPTERS IN BOOKS/OTHER

X. Feng

X. Feng, I.G. Towe, A. Hamza and J. Perez, Replenishing liquid material to membrane, European Patent EP 2717996 (granted Jan 5, 2022).

T. Mekonnen

Mekonnen, T., Chen, G., Rubber Compositions, and Associated Formulation Method and Parts. US Provisional Patent Application No. 63/402,987. Filed July 21, 2022.

Mekonnen, T., Eslami, H. Multilayer Packaging and Related Methods. US Provisional Patent Application No. 63/475,008. Filed on Sept 30th, 2022.

D. Schipper

Copolymer Solution for Metal Oxide Binding Applications. United States of America. # 63/372,427. 2022/03/11. Derek Schipper, Boris Nazareth Pending

M. Tam

Nano-Dispersion Consisting of Cellulose Nanocrystal as Pesticide/Fungicide Carriers for Agriculture and Aquaculture, Tam KC, Tang C.X.; Tang, J.; Kim D.S.; Haji, F., Patent Application #63/475,168, October 21, 2022

Functionalized Cellulose Nanocrystals Stabilized Smart Pickering Emulsion for Enhanced Probiotic Delivery, by Tam KC, Baek JY, Ramasamy M, Cho DG, Patent Application No 63/372,209 February 24, 2022

C. Tzoganakis

C. M.T. Huynh and C. Tzoganakis (2022). Polyolefin-Based TPEs: Reactive Processing, in Advances in Thermoplastic Elastomers: Challenges and Opportunities, S. Jana and N. K. Singha (eds), Elsevier.

E. Vivaldo-Lima

Books edited

Eduardo Vivaldo-Lima and Yousef Mohammadi, Eds., Modeling and Simulation of Polymerization Processes, MDPI: Basel, 2022; ISBN: 978-3-0365-4812-8 (Hbk), 978-3-0365-4811-1 (PDF).

15. OTHER HIGHLIGHTS FOR THE YEAR 2021

Jean Duhamel

Guest editor for the journal Polymers for the issue entitled Current Directions and Innovations in Fluorescence Techniques for Characterization of Polymers and Polymeric Materials.

Co-organizer with Prof. Jérôme Claverie of the Symposium “In Memoriam of Prof. Françoise Winnik” at the CSC in Calgary (June 4-8, 2022).

Michael Tam

Prof. Tam is the associate Editor, ACS Sustainable Chemistry & Engineering.

Vivaldo-Lima

Prof. Vivaldo-Lima became a member of FQ-UNAM’s Editorial Committee, effective June 2022.

Prof. Vivaldo-Lima continued his membership in the UK Research and Innovation International Development Peer Review College (UK, 2018 to present).

Prof. Vivaldo-Lima continued his participation as member of the Professors Evaluation Committee (Comisión Dictaminadora) of the area of Chemical Engineering of FES-Zaragoza UNAM, 2018 to present.

Prof. Vivaldo-Lima continued his role as Patron (Benefactor) of Faculty of Chemistry-UNAM, 2018 to present.

Prof. Vivaldo-Lima acted as journal reviewer/adjudicator for 6 manuscripts in 4 different journals.

Alex Penlidis

2022, Hosted German Prof M Buback (Goettingen) and coordinated tours and discussions with grad students in department (Sept 25/26, 2022)

2022, Journal reviewer, 8 manuscripts

2022, Consultant, 3 companies (USA, Europe); specific names available upon request

2022, Editorial Board Member, Polymer-Plastics Techn. and Eng.

2022, Editorial Board Member, Macromol. React. Eng.

2022, Editorial Board Member, Processes

2022, International/national academic collaborations (regular basis with co-authored articles): UNAM (Mexico), Iran (Paints/Coatings Institute) and, more locally, University of Ottawa, UNB, and Ryerson Polytechnic Univ.

2022, Membership in Professional Societies, CIC, CSE, MSED; Association of Professional Engineers (Europe/Greece); Canadian Academy of Engineering (CAE)

2022, External evaluator for promotion to full professor, Chem Eng Dept, overseas University, October 2022

2022, Abstract evaluator (15 abstracts) and organizer of four half-day sessions on polymerization and polymeric materials, for CSE conference Oct 2022 (August 2022)

B. Zhao

Board of Directors, Waterloo Institute for Nanotechnology (2022 -2025)

Member of the Editorial Board, MDPI Nanomanufacturing (2021-2023)

Co-guest editor for the MDPI Polymer, Special Issue: "Composite Hydrogels towards next-generation functional materials and devices", Nov 2021 – June 2023

Program Committee Member, 2022 Global Summit: Nanotechnology for a Healthier and Sustainable Future, Waterloo, ON, Aug 10-11, 2022

NSERC FTRF Transformation LOI Review Committee for the 2022 competition

INSTITUTE FOR POLYMER RESEARCH
CELEBRATING 38 YEARS OF OFFICIAL INSTITUTE STATUS
FORTY-FOURTH ANNUAL SYMPOSIUM
ON POLYMER SCIENCE/ENGINEERING 2019
Conrad Grebel College
Great Hall
University of Waterloo, Waterloo, Ontario
Wednesday, May 4, 2022

8:30 a.m.	Coffee
8:50	Welcome and Opening Remarks
9:00 - 9:20	Yebin Lee , Chemical Engineering, Waterloo One-Pot Green Synthesis of Cellulose Nanocrystal Gold Nanoshells (Winner of the 2021 IPR Award for Academic Excellence in Polymer Science/Engineering)
9:20 - 10:20	Industry Speaker: Adam Polit Polyanalyki Director of Technology Lorama Group Inc. Innovative Analytical Solutions for Comprehensive Polymer Characterization
10:20 – 10:20	<u>5-Min. Mini Presentations</u> 1) Boris Nazareth Copolymer Solution for Metal Oxide Binding Applications 2) Haoyu Fu Novel Pyrrole Based Polymer for Organic Semiconductor Application 3) Daniel Afzal Exploring the effects of long carbamate chain on amine-based donor-acceptor polymers for sensor and solar cell application 4) Kayoung Kim Polymer-based Gas Sensor for Agricultural Lagoon Monitoring
10:4 – 11:00	Coffee
11:00 – 11:20	Hafez Jafari 3D printable marine-based hydrogel for biomedical applications
11:20 – 11:40	Kristijan Lulic Self-Association of Oligoquinoline Foldamers Probed by Fluorescence Anisotropy
11:40-12:00	<u>5-Min. Mini Presentations</u> 5) Bhoomi Mavani Polymeric materials for detection of aldehydes 6) Scott Flynn Synthesis and Characterization of Novel Ethynyl-Substituted Thiophene Semiconducting Materials for Organic Solar Cells

- 6) **Zhelun Li**
Bio-inspired fabrication of thin-film composite membrane assisted by polyvinylamine
- 7) **Dylan Jubinville**
Chemical modification of wood using a batch mixer

12:00 - 1:00

Lunch

1:00 - 2:00

Academic presenter: John R Dutcher Professor of Physics at the College and Physical Sciences at the University of Guelph
Stiffness and Deformability of Soft Hydrated Polysaccharide Nanoparticles

2:00 – 2:20

Franklin Frasca

Local Conformation of Macromolecules in Solution Characterized by Pyrene Excimer Formation

2:20 – 2:40

Azin Adibi

Alpha-1,3 glucan and natural rubber as a sustainable barrier in paper coating applications

2:40 - 3:00

Junjie Yin , Physics, Waterloo

Surface relaxation of vapor deposited polystyrene glasses

(Winner of 2021 IPR Award for Academic Excellence in Polymer Science/Engineering)

3:00-3:20

Sanjay Patel

Macromolecular Conformations Characterized in Solution by Pyrene Excimer Formation

3:20 - 3:45

Coffee

3:45 – 4:00

5-Min. Mini Presentations

7) **Yi Yuan**

Wide bandgap polymer donor with acrylate side chains for non-fullerene acceptor-based organic solar cells

8) **A-Reum Kim**

Reduced Pressure Drop in Viscoelastic Polydimethylsiloxane Wall Channels

9) **Donghan Liu**

Preparation of Well-Defined Poly(L-Glutamic Acid-co-Phenylalanine) from N-Carboxyanhydrides

4:00-4:20

Ewomazino Ojogbo

Crosslinking of cellulose nanocrystals with epoxidized natural rubber and their reinforcing effect

4:20-4:40

Hunter Little

Persistence Length of Polymeric Bottle Brushes Characterized in Solution by Pyrene Excimer Formation

4:40-5:00

Jiaxin(Sara) Xu

Beta-cyclodextrin functionalized magnetic nanoparticles for the removal of pharmaceutical residues in drinking water

4:40

Closing remarks

6:00 - 7:30

IPR Industrial Member DINNER

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INSTITUTE FOR POLYMER RESEARCH

Dr. Sharon Guo
Global Research and Development
Lanxess Inc.
Research Park
999 Collip Circle
London, ON N6G 0J3
Tel: 519-953-1720
Fax: 519-619-9117
Eml: sharon.guo@lanxess.com

Dr. Navroz Boghani
Mondelez International
100 Deforest Avenue
East Hanover, NJ 07936
Phone: +1 (973) 503-3867
Mobile: +1 (973) 901-8014
Fax: +1 (973) 463-1793
E-mail: navroz.boghani@mdlz.com

Dr. Carla McBain
Synothomer Inc.
2990 Gilchrist Road
Akron, OH 44305-4418
Tel: 330/794-6214
Fax: 330-794-6251
Eml: carla.mcbain@omnova.com

Dr. William H. Sachs
Princeton Polymer Consultants
3 Morgan Pl.
Princeton, N.J. 08540
Tel: 609/688-0314
El: wsachs@alumni.princeton.edu

Polyvation
Kadijik 7D
NL-9747, AT Groningen, NL
Tel: 31-50-368-
0777

Compuplast Canada
5333 Forest Hill Drive
Mississauga, ON L5M 5B7
Tel: 905-814-8923

- 22-001 **Molecular weight development in the superacid-catalyzed polyhydroxyalkylation of 1-propylisatin and biphenyl at stoichiometric conditions**
A. Cruz-Rosado¹, J. Enrique Romero-Hernández¹, M. Ríos-López, S. López-Morales, G. Cedillo², Lucero Mayra Ríos-Ruiz, E. Cetina-Mancilla, J. Palacios-Alquisira, M. G. Zolotukhin, and E. Vivaldo-Lima.
Polymer. 01/22
- 22-002 **Modeling of pretreatment and combined alkaline and enzymatic hydrolyses of blue agave bagasse in corotating twin-screw extruders**
J. C. Morales-Huerta, O. Hernández-Meléndez, F. I. Garcés-Sandoval, C. Montiel, M. G. Hernández-Luna, O. Manero, E. Bárzana and E. Vivaldo-Lima, Green Macromolecular Reaction Engineering. 02/22
- 22-003 **Pyrene Excimer Formation (PEF) and its Application to Study Polypeptides Dynamics**
R. Casier and J. Duhamel
Langmuir. 03/22
- 22-004 **Probing the Interactions between Pour Point Depressants (PPDs), Viscosity Index Improvers (VIIs), and Wax in Octane Using Fluorescently Labeled PPDs**
K. Gholami, F. Frasca and J. Duhamel
Langmuir. 03/22
- 22-005 **Mathematical Description of the RAFT Copolymerization of Styrene and Glycidyl Methacrylate using the Terminal Model**
J. Tenorio-López, J. Benvenuta-Tapia*, N. García-Navarro, E. Vivaldo-Lima*, P. Champagne, and E. Saldívar-Guerra*
Polymers. 03/22
- 22-006 **Antimicrobial Polymeric Composites for High-touch Surfaces in Healthcare Applications**
M. Liu, L. Bauman, C. Nogueira, M. Aucoin, W. Anderson, B. Zhao
Biomedical Engineering. 04/22
- 22-007 **Alkyloxime-substituted thiophene-based wide bandgap polymer donor achieving high short circuit current density of 30 mA cm⁻² in organic solar cells**
Y. Jiang, H. Liu, X. Li, Y. Yuan, J. Wang, B. Cui, Y. Li
Chemistry of Materials. 04/22
- 22-008 **Performance Evaluation of Nonacosan-10-ol based Polyethylene Packaging Material using Molecular Dynamics Simulations**
C. Madhuranthakam, S. Pandiyan, A. Penlidis
Polymers. 04/22

- 22-009 **Wide bandgap polymer donor with acrylate side chains for nonfullerene acceptor-based organic solar cells**
Y. Yuan, P. Kumar, J. Ngai, X. Gao, X. Li, H. Liu, J. Wang, and Y. Li
Macromolecular Rapid Communications. 04/22
- 22-010 **Indium Oxide Doped Polyaniline for Detection of Formaldehyde**
B. Mavani and A. Penlidis
Macromolecular Reaction Engineering. 05/21
- 21-011 **Detection of Volatile Organic Compounds by Using MEMS Sensors**

M. Arabi, M. Alghamdi, K. Kabel, A. Labena, W. Gado, B. Mavami, A. Scott, A. Penlidis, M. Yavuz, E. Abdel-Rahman.
MDPI. 05/21
- 21-012 **Characterization of the Interactions between Unassociated Cationic Pyrene-Labeled Gemini Surfactant and Anionic Sodium Dodecyl Sulfate**

AT. Basalem, R. Gong, J. Duhamel
Langmuir 05/22
- 21-013 **Lithiated carboxylated nitrile butadiene rubber with strong polysulfide immobilization ability as a binder for improving lithium-sulfur battery performance**

Z. Ma, Z. Zuo, A. Vahidifar, A. Ghanbari, Y. Shi, S. Yu, Y. Li
Journal of Power Sources. 06/22
- 21-014 **Adhesive Hydrogels Tailored with Cellulose Nanofibers and Ferric Ions for Highly Sensitive Strain Sensors**

C. Shan, M. Che, A. Cholewsinski, J. Kunihiro, E. Yim, R. Su, and B. Zhao
Chemical Engineering Journal. 07/22
- 22-015 **Cluster Size of Amylopectin and Nanosized Amylopectin Fragments Characterized by Pyrene Excimer Formation**

D. Kim and J. Duhamel
Polymers, 8/22
- 21-016 **End Group Analysis of Polyisobutylene Succinic Anhydride (PIBSA) Carried out with Pyrene Excimer Fluorescence**

F. Frasca and J. Duhamel
Industrial & Engineering Chemistry Research 09/22

- 22-017 **Effects of replacing carbamate with alkyl side chains on the properties and temperature sensing performance of hemi-isoindigo-based polymers**
S. Flynn, J. Ngai, H. Liu, X. Li, J. Wang, Y. Li
Flexible and Printed Electronics. 9/22
- 22-018 **Interior of Glycogen Probed by Pyrene Excimer Fluorescence**
D. Kim and J. Duhamel
Carbohydrate Polymers. 10/22
- 22-019 **A critical review of microplastic degradation and material flow analysis towards a circular 1 economy**
A Cholewinski, E. Dadzie, C. Sherlock, W. Anderson, T. Charles, K.Habib, S. Young, B. Zhao
Environmental Pollution. 10/22
- 22-020 **Thermoresponsive Starch Nanoparticles for the Extraction of Bitumen from Oil Sands**
N. Dasgupta, J. Wang, V. Thu An Nguyen and M. Gauthier
Colloids and Interfaces. 11/22
- 22-021 **Kinetics of polymer network formation by nitroxide-mediated radical copolymerization of styrene/divinylbenzene in super-critical carbon dioxide**
G. Jaramillo-Soto, S. A. Sarracino-Silva, and E. Vivaldo-Lima
Processes. 11/22
- 22-022 **Co-Fermentation of Glucose-Xylose Mixtures from Agroindustrial Residues by Ethanogenic Escherichia coli strains**
E. Sierra-Ibarra, A. Vargas-Tah, C. L. Moss-Acosta, B. Trujillo-Martinez, E. Molian-Vazquez, A. Rosas-Aburto, A. Valdivia-Lopez, M. Hernandez-Luna, E. Vivaldo-Lima and A. Martinez.
Molecules. 12/22
- 22-023 **A Flexible Corn Starch-based Biomaterial Device Integrated with Capacitive-coupled Memristive Memory, Mechanical Stress Sensing, Synapse, and Logic Operation Functions**
A Sun, Y. Chen, G. Zhou, Y. Zhou, T. Guo, S. Zhu, S. Mao, Y. Zhao, J. Shao, Y. Li
Advanced Electronic Materials. 12/22
- 22-024 **Gecko-Inchworm inspiration towards a holistic untethered soft robot for climbing on walls and ceilings**
J. Sun, L. Bauman, L. Yu, and B. Zhao
Cell Reports Physical Science. 12/22

- 22-025 **Mapping 3D Printability of Ionically Cross-Linked Cellulose Nanocrystal Inks: Architecting from Nano- to Macroscale Structures**
M. Amini, M. Kamkar, F. Ahmadijokani, S. Ghaderi, O. Rojas, H. Hosseini, and M. Arjmand.
BioMolecules. 12/22
- 22-026 **Large amplitude oscillatory shear flow: Microstructural assessment of polymeric systems**
M. Kamkar, R. Salehiyan, T. Goudoulas, M. Abbasi, C. Saengow, E. Erfanian, S. Sadeghi, G. Natale, S. Rogers, A. Giacomini, U. Sundararaj.
Progress in Polymer Science. 12/22
- 22-027 **Room temperature, simple and efficient synthesis and functionalization of aromatic poly(arylene sulfide)s, poly(arylene sulfoxide)s and poly(arylene sulfone)s**
E. Cetina-Mancilla, G. Reyes-Garcia, M. Rodriguez-Molina, M. Zolotukhin, E. Vivaldo-Lima, M. Gonzalez-Diaz, and G. Ramos-Ortiz
Eur. Polymer. Journal. 12/22