

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

**NEWSLETTER 2019**

**1. NOTE FROM PROFESSOR JEAN DUHAMEL, IPR DIRECTOR**

Following in the footsteps of 2018 which marked the 40th anniversary of the IPR, 2019 has been a busy year for the IPR with our on-going students' presentations, distinguished IPR Lectureship, and annual IPR Symposium. But before getting to these exciting activities, it is worth announcing the addition of Prof. Tizazu Mekonnen to the IPR membership. Prof. Mekonnen, who was recently hired in Chemical Engineering, brings to the IPR an expertise in renewable polymers, polymer blends and nanocomposite and we are giving him a warm welcome to the IPR. As part of our series on students' presentations, Shahid Muhammad from the Tam laboratory (Chem. Eng.) gave a talk on microcalorimetry and its application to probe interactions between small amphiphilic molecules and polymers, Junyie Yin from the Forrest laboratory (Physics) described how to study the crystallization of highly monodisperse oligo(ethylene oxide)s, and Allison Scott from the Penlidis laboratory (Chem. Eng.) explained how to determine the reactivity ratios of different monomers used for copolymerization. We were also delighted to host Prof. Mitch A. Winnik from the University of Toronto as our 2019 distinguished IPR speaker who gave an inspiring talk on February 5th, 2019 entitled "Biomedical Applications of Metal-Chelating Polymers and Lanthanide Nanoparticles". We had also a talk on August 8th, 2019 on "Functional Modification, Controllable Fabrication, and Biomedical Applications of Natural Polymer Hydrogels".

Of course, the main activity of the IPR is the annual symposium which took place on May 8th, 2019. This year, Prof. Elizabeth Gillies from Western University (London) and Dr. Anna Mathew from Dupont (Kingston) were the two keynote speakers of the IPR Symposium. Their presentation on, respectively, "Design and Development of New Functional Polymers for Biomedical Applications" and "DuPont's Renewably Sourced High-Performance Polyamides" were very well attended by students and faculties alike. Jenner Ngai from the Li laboratory (Chem. Eng.) and Shahid Islam from the Tam laboratory (Chem. Eng.) were the IPR awardees and they received a check price worth \$ 600 each. Together, the symposium hosted 24 oral presentations from graduate students on a wide range of topics that ranged from functional nanocellulose to conjugated polymers. These oral presentations were followed by an evening poster session held at the University Club. As usual, the symposium continues to provide a great venue for our industry visitors to interact with students and faculty members, and fostering research exchanges between Academia and Industry. The annual IPR Symposium remains the main venue where the institute displays the breadth and depth of its research and continues to be the must-attend IPR event of the year.

Among the highlights of this year, Prof. Mario Gauthier continues to represent the IPR on the international stage as recipient of the High-end Foreign Experts Program Award with Wuhan in the Hubei Province (China). Jean Duhamel spent a week at the University of Bordeaux to foster exchanges with the University of Waterloo as part of an on-going collaboration that uses fluorescence anisotropy to study fluorescently labeled foldamers prepared in Bordeaux.

In terms of editorial duties, Profs. Penlidis and Vivaldo Lima are both serving on the editorial board of J. Macromol. Sci.- Pure Appl. Chem. and Prof. Penlidis serves also on the editorial board of Appl. Chem. Polymer-Plastics Techn. and Eng., Macromol. React. Eng., and Processes. Prof. Jean Duhamel is an associate editor with Polymers and will serve as a Guest Editor of a special issue on the "Chemical and Physical Properties of Polysaccharides and their Derivatives". Prof. Jean Duhamel is also a member of the Editorial Advisory Board of Langmuir and Macromolecules.

The 41st IPR Symposium has been scheduled on May 6th, 2020. Dr. Valérie Farrugia from Xerox and Prof. Eduardo Vivaldo-Lima will be our two keynote speakers. Departing from tradition, the afternoon of the 2020 IPR symposium will host a mini symposium on Modification, Characterization, and Applications of Polysaccharides. Profs. Mekonnen,

Simon, Zhao, and Duhamel have already confirmed their participation to the mini-symposium with 20-min talks. The morning session of the IPR symposium will be a general session on polymer science and engineering, in-keeping with the traditional format of the IPR Symposium.

I want to conclude this newsletter by re-iterating that the up-coming IPR symposium promises to be a true “Polymer Feast” and the entire IPR community looks forward to welcoming you at this year 42nd IPR Symposium to be held on May 6th, 2020.

## 2. ANNUAL IPR SYMPOSIUM

The 42nd Annual IPR Symposium will be held May 6, 2020. A schedule and registration forms will be circulated electronically.

Many thanks to all who participated in the 2019 Symposium (an audience of about 90 people). IPR received very positive feedback regarding the topics covered. The 2019 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 2019, the IPR office sent out 20 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 (see list attached of research personnel, Appendix 4). For more information on any project, please email/call the appropriate supervisor or the IPR office at <ipr@uwaterloo.ca>, 519/888-4789.

## 6. RECENTLY GRADUATED STUDENTS

### J. Duhamel

MSc	Chem	Wang, J.	Characterization of the Conformation of Oligophenylenevinylene-Labeled Oligoquinolones in Solution by Fluorescence Anisotropy
MSc	Chem	You, Z.	Effect of Oligomer Presence on Polymer Diffusion During Latex Film Formation

### X. Feng

MASc	ChE	Albiladi, A.	Reverse osmosis desalination and hybrid processes for brine treatment
PhD	ChE	Halakoo, Elnaz	Thin film composite membranes for pervaporation separations

### M. Gauthier

PhD	Chem	Amos, R.	Hydrophobic Modification of Starch Nanoparticles
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### Y. Li

MASc	ChE	Zhang, Z.	Development of Low-cost Organic Solar Cells Using Polythiophenes As Donors
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### A. Penlidis

PhD	ChE	Khoury, J.	Chitosan Edible Films Crosslinked by Citric Acid
MASc	ChE	Majdabadifarahani, N.	Evaluating Polymeric Materials for Sensing of Gaseous Analytes
PhD	ChE	Scott, A.	Design of Polymeric Materials: Novel Functionalized Polymers for Enhanced Oil Recovery & Gas Sorption

**C. Tzoganakis**

MASc ChE Zhang, X. Chemical Modification of Polybutene-1 Resins

**E. Vivaldo-Lima**

M.Eng Meng Gomez Reguera, J.A., Modeling of the Free Radical Copolymerization Kinetics of n-Butyl Acrylate, Methyl Methacrylate and 2-Ethylhexyl Acrylate Using PREDICI®

PhD ChE Pere-Salinas, P. Síntesis y caracterización de redes poliméricas con heterogeneidad reducida usando copolimerización RAFT de metacrilato de hidroxietilo (HEMA) y dimetacrilato de etiléniglicol (EGDMA) en dióxido de carbono supercrítico (scCO<sub>2</sub>)

**B. Zhao**

PhD ChE Cholewinski, A. Hydrogel Composite Adhesives Inspired by Algae and Mussels

**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	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.C. 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/](http://www.uwaterloo.ca/institute-polymer-research/)

## **8. MEMBER COMPANIES—2019**

Currently we have **6 member companies**: (refer also Appendix 3)

Afton

Compuplast Canada Inc.

Lanxess Inc.

OMNOVA Solutions Inc.

PolyVation, The Netherlands

Princeton Polymer Consultants, USA

## **9. STUDENT AWARDS**

### **T. Mekonnen**

Joanna Jardin - NSRC Canada Graduate Scholarships-Master's Program Award (2019)

### **A. Penlidis**

Alison Scott NSERC Alexander Graham Bell Canada Graduate Scholarship & President's Graduate Scholarship, 2016-2019

### **B. Zhao**

A-Reum Kim was awarded the 2019 Dr. Garry Rempel Memorial Scholarship

Lukas Bauman won the 3rd place in the competition of the poster presentation at the 69th Canadian Chemical Engineering Conference, Halifax, Oct 2019

Pengxiang Si, David Johnston International Experience Award, 2019

## **10. FACULTY AWARDS**

### **M. Gauthier**

Hubei Province Foreign Experts Program, to spend 2 months per year carrying out research in China.

### **Yuning Li**

WIN Research Leader Award

### **Boxin Zhao**

Prof Boxin Zhao received the Faculty of Engineering Distinguished Performance Award (for outstanding contribution in teaching, scholarship and service), University of Waterloo

## 11. FULL REFEREED JOURNAL PAPERS

### J. Duhamel

Design, characterization, optical and photophysical properties of novel thiophene monomers and polymers containing pyrene moieties linked via rigid and flexible spacers. Morales-Espinoza, E.; Ruiu, A.; Valderrama-García, B. X.; Duhamel, J.; Rivera\*, E. Synth. Met. 2019, 248, 102-109.

Surfactant-Structure Dependent Interactions with Modified Starch Nanoparticles Probed by Fluorescence Spectroscopy. Zhang, Q.; Kim, D.; Li, L.; Patel, S.; Duhamel\*, J. Langmuir 2019, 35, 3432-3444.

Probing the Interactions between Mimics of Pour Point Depressants (PPDs) and Viscosity Index Improvers (VIIs) in Engine Oil Using Fluorescently Labeled PPDs. Gholami, K.; Jiang, S.; Duhamel\*, J. Macromolecules 2019, 52, 2651-2658.

Wang, J.; Little, H.; Duhamel\*, J.; Li, X.; Nagula, M.; Maurizot\*, V.; Huc\*, I. Dimensions of Quinoline-Based Foldamers Labeled with Oligo(phenylene vinylene) Probed in Solution by Time-Resolved Fluorescence Anisotropy. Macromolecules 2019, 52, 5829-5837.

Detection of Nitroaromatics Using the Excimer Fluorescence of Pyrene-Labeled Starch Nanoparticles. Patel, S.; Li, L.; Duhamel, J. Langmuir 2019, 35, 13145-13156.

Little, H.; Wang, J.; Duhamel\*, J.; Li, X.; Nagula, M.; Maurizot\*, V.; Huc\*, I. Simplification in the Acquisition and Analysis of Fluorescence Decays Acquired with Polarized Emission for Time-Resolved Fluorescence Anisotropy Measurements. Anal. Chem. 2020, 92, 668-673.

### X. Feng

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Y. Huang, X. Feng (2019), "Polymer-enhanced ultrafiltration: Fundamentals, applications and recent developments," *Journal of Membrane Science*, 586, 53–83.

Z. Pan, C. Song, L. Li, H. Wang, Y. Pan, C. Wang, J. Li, T. Wang, X. Feng (2019), "Membrane technology coupled with electrochemical advanced oxidation processes for organic wastewater treatment: recent advances and future prospects," *Chemical Engineering Journal*, 376, 120909.

Q. Wei, S. Lin, X. Feng, G.L. Rempel, Q. Pan (2019), "Synthesis of superhydrophobic graphene/formaldehyde-melamine-sodium bisulfite copolymer sponge and its application as absorbent for oil water separation," *Acta Materialiae Compositae Sinica*, 36, 1728-1736.

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B. Ode Boni, L. Lamboni, T. Souho, M. Gauthier, G. Yang.

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Transition from Confined to Bulk Dynamics in Symmetric Star–Linear Polymer Mixtures. *arXiv.org, e-Print Archive, Condensed Matter* 2019, 1-35.

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#### **A. Penlidis**

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#### **M. Tam**

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## **D Schipper**

Monika R. Kulak, Serxho Selmani, Derek J. Schipper\* “Sonication-Enhanced Single-Walled Carbon Nanotube Selectivity for the Alignment Relay Technique” *ACS Appl. Nano Mater.* 2019, 10, 6637.

Serxho Selmani, Derek J. Schipper\* “ $\pi$ -Concave Hosts for Curved Carbon Nanomaterials” *Chem. Eur. J.*, 2019, 25, 6673 – 6692. Invited Review, Journal Frontispiece.

Sunmeng Wang, Derek J. Schipper\* “A Low Cost Polarized Optical Microscope for Undergraduate Studies” *J. Chem. Ed.*, 2019, 96, 823-826.

Ryan E. Moreira, Geoffrey S. Sinclair, Derek J. Schipper\* “Oxidative Ring-Opening of Benzothiazole Derivatives” *Can. J. Chem.*, 2019, 97, 360-365.

## **C. Tzoganakis**

X. Zhang, C. Tzoganakis and M. Zatloukal (2019). “Chemical Modification of Polybutene-1 Resins through Reactive Processing”, Proceedings of the 77th Annual Technical Conference of the Society of Plastics Engineers, March 2019, Detroit, MI, USA.

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## **E. Vivaldo-Lima**

Anete Joceline Benitez-Carreón, Jesús Guillermo Soriano-Moro, Eduardo Vivaldo-Lima\*, Ramiro Guerrero-Santos, and Alexander Penlidis, “New Aspects on the Modeling of Dithiolactone-Mediated Radical Polymerization of Vinyl Monomers”, *Processes*, 7(11), 842, 2019 (14 pages); <https://doi.org/10.3390/pr7110842>.

Juan José Benvenuta-Tapia\*, Eduardo Vivaldo-Lima, and Ramiro Guerrero-Santos, “Effect of copolymers synthesized by nitroxide mediated polymerization as chain extenders of postconsumer poly(ethylene terephthalate) waste”, *Polym. Eng. Sci.*, 59(11), 2255-2264, 2019, DOI: 10.1002/pen.25228.

Javier Gomez-Reguera, Eduardo Vivaldo-Lima, Vida Gabriel, Marc A. Dubé\*, Modeling of the Free Radical Copolymerization Kinetics of n-Butyl Acrylate, Methyl Methacrylate and 2-Ethylhexyl Acrylate Using PREDICI®, *Processes*, 7(7), 395, 2019; <https://doi.org/10.3390/pr7070395>.

Juan José Benvenuta-Tapia\*, Eduardo Vivaldo-Lima, Abigail Martínez-Estrada, Martin Hernández-Valdez, Sergio Paredes-Castañeda, Cesar Ramos-Valdes, “Enhanced asphalt performance upon addition of RAFT-synthesized reactive multi-block copolymers”, *Mater. Chem. Phys.*, 227, 269-278, 2019, DOI: <https://doi.org/10.1016/j.matchemphys.2019.02.004>.

Miguel Ángel Vega-Hernández, Alberto Rosas-Aburto, Eduardo Vivaldo-Lima\*, Humberto Vázquez-Torres, Gema Susana Cano-Díaz, Patricia Pérez-Salinas, Martin Guillermo Hernández-Luna, Jorge Alcaraz-Cienfuegos, Mikhail G. Zolotukhin, “Development of polystyrene composites based on blue agave bagasse by in situ RAFT polymerization”, *J. Appl. Polym. Sci.*, 136(8), 47089, 2019, DOI: 10.1002/app.47089.

## **B. Zhao**

Wei Zhang, † Ruixing Wang, ZhengMing Sun, † Xiangwei Zhu, Qiang Zhao, † Tengfei Zhang, Aleksander Cholewinski\*\*, Fut (Kuo) Yang\*, Boxin Zhao †, Rattapol Pinnaratip, Pegah Kord Forooshani, and Bruce P. Lee†, “Catechol-Functionalized Hydrogels: Biomimetic Design, Adhesion Mechanism, and Biomedical Applications”, Chemical Society Reviews, Accepted, Dec 19, 2019

Bona Deng\*, Pengxiang Si\*, Lucas Bauman\*, Jun Luo, Mingjun Rao, Zhiwei Peng, Tao Jiang, Guanghui Li†, Boxin Zhao†, “Photocatalytic activity of perovskite (CaTiO<sub>3</sub>) derived from roasting process of bauxite residue”, Journal of Cleaner Production, Accepted, Sept 27, 2019

Geoff Rivers\*\*, Li Yu\*\*, and Boxin Zhao†, “Cellulose Nanocrystal and Silver Nanobelt Gel: Cooperative Interactions Enabling Dispersion, Colloidal Gels, and Flexible Electronics”, Langmuir, Accepted, Aug 8, 2019

Fut (Kuo) Yang\*, Aleksander Cholewinski\*, Li Yu\*\*, Geoffrey Rivers\*\*, and Boxin Zhao†, “A Hybrid Material That Reversibly switches Between Two Stable Solid States”, Nature Materials, Accepted, June 14, 2019

Bona Deng\*, Guanghui Li†, Jun Luo, Qing Ye, Mingxia Liu, Mingjun Rao, Tao Jiang, Lukas Bauman, Boxin Zhao, Selectively leaching the iron-removed bauxite residues with phosphoric acid for enrichment of rare earth elements, Separation and Purification Technology, Accepted, June 17, 2019

Li Chen\*\*, Pengxiang Si\*; Boxin Zhao†, “Biotemplated synthesis of cellulose nanocrystal@PVP-assisted polydopamine@Ag nanoparticle as conductive composites”, J Materials Science, Electronic Materials, Accepted, May 20, 2019.

Pengxiang Si\*, Li Chen, and Boxin Zhao†, Alex Chen, John Persic and Robert Lyn, “Stretchable polyurethane-based conductive ink for e-textile applications”, Journal of Surface Mount Technology, Accepted, Apr 3, 2019

## **13. CONFERENCE PRESENTATIONS/INVITED SEMINARS**

### **J. Duhamel**

Helices and Helix Density Probed in Complex Macromolecules by Pyrene Excimer Fluorescence. Duhamel, J. 102nd Canadian Chemistry Conference and Exhibition, June 5th, 2019.

Length Scales and Dynamics of Polymers in Solutions and Solids Probed by Pyrene Excimer Formation. Duhamel J. Keynote Speaker at the 2019 Global Chemistry Conference, New York, NY, USA, March 20-21, 2019.

Characterization of Helices and their Arrays in Biological and Synthetic Macromolecules by Time-Resolved Fluorescence. Duhamel, J. Invited Speaker at the 2019 Global Chemistry Conference, New York, NY, USA, March 20-21, 2019.

How Good is Pyrene Excimer Fluorescence at Probing Macromolecules Compared to Fluorescence Resonance Energy Transfer (FRET). Duhamel, J. Laboratoire de Chimie des Polymères Organiques (LCPO), Pessac, France, April 1st, 2019.

Helices in Biological and Synthetic Macromolecules Probed by Time-Resolved Fluorescence. Institut Européen de Chimie – Biologie, Pessac, France, April 4th, 2019.

## **X. Feng**

X. He, X. Feng, Q. Pan, "Synthesis and characterization of porous polymer microspheres for efficient cleaning up of oil and organic solvents in water," presented at the 69th Canadian Chemical Engineering Conference, Halifax, NS, Oct 20-23, 2019.

X. He, S. Lin, X. Feng, Q. Pan, "Synthesis of polyurethane foams doped with multi-walled carbon nanotubes for oil-water separation," presented at the 69th Canadian Chemical Engineering Conference, Halifax, NS, Oct 20-23, 2019.  
X. Wang, X Feng, "Development of high permselective oleophilic membranes for VOC/N<sub>2</sub> separation," presented at the 69th Canadian Chemical Engineering Conference, Halifax, NS, Oct 20-23, 2019.

X. Feng, "Extraction of fibroin from silkworm cocoons and its applications for functional membranes/films," presented at National University of Singapore, Singapore, Aug 7, 2019.

X. Feng, "Modelling of sorption kinetics: misapplications overlooked and rectifications," Invited Keynote at the 6th International Conference on Fluid Flow, Heat and Mass Transfer (FFHMT'19), Ottawa, ON, Jun 18 - 19, 2019.

## **M. Gauthier**

102nd Canadian Chemistry Conference, June 2019, Quebec City, QC.  
"Hydrophobic Modification of Cooked Starch with Maleated Vegetable Oil"

Wuhan University of Science and Technology, Wuhan, China, May 2019.  
"Castor Oil-Isocyanate Prepolymers as Cross-linkers for Starch"

Huazhong University of Science and Technology, Wuhan, China, June 2019.  
"Hydrophobic Modification of Starch Nanoparticles for Drug Delivery"

## **M. Tam**

Advanced Functional Materials from Nanopolysaccharides, editors: Ning Lin, Juntao Tang, Alain Dufresne, Kam C Tam, Springer Series in Biomaterials Science and Engineering, Springer Nature, Singapore 2019

Kim, D.S.; Islam, M.S.; Tam, K.C., Chapter 5-The Use of Nano-Polysaccharides in Biomedical Applications p.171-219, in Advanced Functional Materials from Nanopolysaccharides, Springer Nature 2019

## **D Schipper**

Derek J. Schipper. "Dehydration Polymerization for Poly(hetero)arene Conjugated Polymers" American Chemical Society Spring National Meeting, Orlando, Florida March 31, 2019. Invited Presentation.

Derek J. Schipper. "Pi-functional Materials Enabled by Synthetic Advances" Waterloo Institute for Nanotechnology-MESA+ Workshop, University of Twente, Enschede, the Netherlands October 16, 2019.

Derek J. Schipper. "Pi-functional Materials Enabled by Synthetic Advances" SUN-WIN Bilateral Workshop, Soochow University, Jiangsu, China December 3, 2019.

## **A. Penlidis**

Al-Ghamdi, M., R. Saritas, K. M. E. Stewart, A. J. Scott. M. Khater, A. Alneamy, A. Abdel-Aziz, H. Nafissi, E. Abdel-Rahman and A. Penlidis (2019). Aqueous media electrostatic MEMS sensors, paper if full in Refereed Conference Proceeding, PID5847587 (4 pgs), IEEE Transducers 2019/Eurosensors XXXIII, June 23-27, 2019, Berlin, Germany.

### **Y. Li**

Y. Li (invited) Development of functional polymer materials for printed electronics, WIN-MESA+ Workshop, University of Twente, Holland, on October 16, 2019.

Y. Li (invited), Enabling polymer materials for printed electronics, The 4th SUN-WIN Bilateral Workshop, Soochow University, Soochow China, on December 3, 2019.

### **C. Tzoganakis**

X. Zhang, C. Tzoganakis and M. Zatloukal (2019). "Chemical Modification of Polybutene-1 Resins through Reactive Processing", Proceedings of the 77th Annual Technical Conference of the Society of Plastics Engineers, March 2019, Detroit, MI, USA.

X. Zhang, C. Tzoganakis and M. Zatloukal (2019). "Production of Controlled-Rheology Polybutene-1 Resins through Reactive Processing", 35th Annual Meeting of the Polymer Processing Society, Cesme, Turkey, May 2019.

### **E. Vivaldo-Lima**

DETERMINATION OF THE HYDROXYL GROUPS AVAILABLES FOR GRAPHTING IN NATURAL FIBERS" (Poster), Gema Susana Cano Díaz, Alberto Rosas Aburto, Leticia Flores Santos, Eduardo Vivaldo Lima, Elvira Santos Santos, Miguel Ángel Vega Hernández, Norma Castillo Rangel, XXVIII International Materials Research Congress (IMRC), Cancún Quintana Roo, México, August 18-23, 2019.

"SYNTHESIS OF BIOBASED GRAFT COPOLYMERS FOR WASTEWATER TREATMENT" (Póster), Miguel Ángel Vega Hernández, Karina Itzel Rosas-Pérez, Gema Susana Cano Díaz, Patricia Perez-Salinas, Alberto Rosas Aburto, Eduardo Vivaldo Lima, XXVIII International Materials Research Congress (IMRC), Cancún Quintana Roo, México, August 18-23, 2019.

"HYDROGELS AS POLYMER SOLID ELECTROLYTE WITH GRAPHENE FOR FLEXIBLE BATTERIES" (Póster), Ismael Arroyo Díaz, Carlos Hipólito Antonio-Hernández, Alberto Rosas Aburto, Eduardo Vivaldo Lima, Pedro Roquero Tejeda, XXVIII International Materials Research Congress (IMRC), Cancún Quintana Roo, México, August 18-23, 2019.

"Análisis de Sensibilidad de los Parámetros del Crecimiento de Lactobacillus Acidophilus en Fermentaciones Lácticas" (Parameter sensitivity analyses for Lactobacillus Acidophilus growth in lactic fermentations), FRANCISCO CABALLERO, EDUARDO VIVALDO-LIMA, BLANCA E. GARCÍA and GABRIEL RAMÍREZ-DÁMASO, 14° Congreso Interamericano de Computación Aplicada a la Industria de Procesos (14th Interamerican Congress on Applied Computation for Process Industries)- CAIP'2019, Lima, Perú, October 21-24, 2019.

### **B. Zhao**

Li Yu, Che Zhang, Pengxiang Si, and Boxin Zhao, "Programmable Liquid Crystal Polymer Networks for Soft Robotics" 2019 Annual meeting of the Adhesion Society, Feb 17-20, Hilton Head Island, NC.

Lukas Bauman, Boxin Zhao, Dan Sameoto, Quan Wen, "Poly(N-isopropylacrylamide) grafted PDMS micropillars enabling smart switchable wettability: hydrophilic-to-hydrophobic transition", 69th Canadian Chemical Engineering Conference, Halifax, Oct 2019

Boxin Zhao, "Smart polymers and interfacial engineering for advanced manufacturing", WIN-Soochow Workshop, Suzhou, China, Dec 3-6 2018

Boxin Zhao, "Surface science and bio-nanomaterials for advanced sustainable manufacturing", WIN-MESA+ Workshop in October 2019, University of Twente, Netherlands

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

##### **M. Gauthier**

Z. Cheng, P. Liu, S. Zeng, H. Hu, G. Li, H. Wang, X. Yan, M. Gauthier.

High-molecular-weight Polyester Based on Biomass Monomer Dimethyl 2,5-Dimethoxyterephthalate, Manufacture Method, and Application. Faming Zhuanli Shenqing 2019, CN 109293907 A 20190201 (Chinese patent application).

Z. Cheng, S. Zeng, H. Hu, P. Liu, G. Li, J. Xiong, M. Gauthier.

Bio-based Polyester Having Bridged Structure and Preparation Method and Application Thereof. Faming Zhuanli Shenqing 2019, CN 109438687 A 20190308 (Chinese patent application).

##### **X. Feng**

Z. Tan, Q. Li, X. Feng, D. Wu, Y. Zhang, "Cobalt complex recycling method for cobalt ammonia absorbent for simultaneous flue gas desulfurization and denitrification," CN Patent No. CN 106268184 (issued Feb 22, 2019); International Application No. PCT/CN2017/093673.

##### **C. Zhao**

Boxin Zhao and Pengxiang Si, "The composition, fabrication and application of latex-polyelectrolyte composite film of switchable transparency", US Provisional application for patent, # 62934280, Nov 12, 2019

Ehsan Marzbanrad, Ehsan Toyserkani, Boxin Zhao, Jeremy Vandenberg, Chromium Metal Mixtures with Core-Shell Nanoparticle Fabrication US Patent Application: #89362320, Aug 2, 2019.

Ehsan Marzbanrad, Ehsan Toyserkani, Boxin Zhao, Elahe Jabari, Jeremy Vandenberg, "Ink Formulation For Chromium Nanoparticles Mixtures", US Patent Application, #89362307, Aug 2, 2019

Fut Kuo Yang, Aleksander Cholewinski, and Boxin Zhao, "Composition, Fabrication, and Applications of a Hybrid Material that Reversibly Switches Between Two Stable Solid States", US Provisional application for patent #US 62/864,027, Filed on July 11, 2019

#### **15. OTHER HIGHLIGHTS FOR YEAR 2018**

Prof. Duhamel is a member of the Advisory Editorial Boards of *Langmuir* and *Macromolecules*. He is an associate editor for the journal *Polymers*.

Prof. Duhamel organized a symposium entitled “Progress in Polysaccharide Characterization and Chemical Modification” at the 102<sup>nd</sup> Canadian Chemistry Conference in Québec City.

Prof Penlidis acted as journal reviewer for 20 manuscripts, and as journal adjudicator for 5 manuscripts.

Prof Penlidis acted as consultant for 8 companies (Canada, USA and Europe).

Prof. Penlidis is hosting at Waterloo Prof. Eduardo Vivaldo-Lima, UNAM, Mexico, as a visiting scholar (sabbatical leave from UNAM) from Aug 1, 2019-July 31, 2020.

Prof Penlidis served on the editorial boards of the following journals: Polymer-Plastics Techn. and Eng.; Macromol. React. Eng. (considerable work as editorial board member and adjudicating for editor); Processes (considerable work as editorial board member promoting special issues, organizing surveys and adjudicating for editor).

Professor Penlidis’ 2019 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.).

Prof. Vivaldo-Lima continued serving on the editorial board of J. Macromol. Sci.-Pure Appl. Chem.

Prof. Vivaldo-Lima continued serving as member of FQ-UNAM’s (Faculty of Chemistry, UNAM) Research Advisory Council (“Consejo Asesor de Investigación”, CAI), representing its Chemical Engineering Department, until June 2019, after almost five years of participation.

Prof. Vivaldo-Lima started in august 2019 a one-year appointment as Visiting Professor at the Department of Chemical Engineering of the University of Waterloo, working in Prof. Penlidis group on the modeling of polymer branching and reversible deactivation radical polymerization.

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 5 manuscripts in 3 different journals.

Prof. Zhao was a Session organizer, Nanotechnology and polymer sessions, 69th Canadian Chemical Engineering Conference, Halifax, Oct 2019

Prof. Zhao was a Session co-organizer, Physics of Bioadhesion, 2019 Annual meeting of the Adhesion Society, Hilton Head, South Carolina, Feb 2019

**INSTITUTE FOR POLYMER RESEARCH**  
**CELEBRATING 35 YEARS OF OFFICIAL INSTITUTE STATUS**  
**FORTY-FIRST ANNUAL SYMPOSIUM**  
**ON POLYMER SCIENCE/ENGINEERING 2019**  
 Conrad Grebel College  
 Great Hall  
 University of Waterloo, Waterloo, Ontario  
 Wednesday, May 8, 2019

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8:30 a.m.	<b>Coffee</b>
8:50	<b>Welcome and Opening Remarks</b>
9:00 - 9:20	<b>Shahid Islam, Chemical Engineering, Waterloo</b> Functional Cellulose Nanocrystals (F-CNCs) for high plasma cholesterol reduction: A Novel Application <b>(Winner of the 2018 IPR Award for Academic Excellence in Polymer Science/Engineering)</b>
9:20 - 10:00	<b>Academic Speaker: Professor Elizabeth Gilies , The University of Western Ontario</b> <b>Design and Development of New Functional Polymers for Biomedical Applications</b>
10:00 – 10:25	<u><b>5-Min. Mini Presentations</b></u> <b>1) Weize Yuan</b> Characterization of the Conformation of Partially Unfolded Poly(Glutamic Acid) in DMF by Pyrene Excimer Fluorescence <b>2) Junjie Yin</b> Same average molecular weight, same glass transition temperature? <b>3) Prachi Panchal</b> CNC modified with UV absorber <b>4) Janine Thoma</b> Polymeric Bottle Brushes: Conformation and Dynamics Investigated by Pyrene Excimer Fluorescence <b>5) Natun Dasgupta</b> Starch-Stabilized Iron Oxide Nanoparticles for the Photocatalytic Degradation of methylene Blue
10:25 – 10:50	<b>Coffee</b>
10:50 – 11:10	<b>Yang Yang</b> Nanoconfinement of the Aqueous Bilayer Membrane of Self-assembled Vesicles Probed by Fluorescence Emission
11:10 – 11:30	<b>Ewomazino Ojogbo</b> Functionalized Starch Microparticles for Antimicrobial Polymer Surfaces
11:30 – 11:55	<u><b>5-Min. Mini Presentations</b></u> <b>6) Geoffrey Sinclair</b> Oxidation of Thiazoles for use in Conjugated Polymer Synthesis <b>7) Nicole Francis</b> Ionic Strength Effects on the Terpolymerization of Acrylamide/Acrylic Acid/Sulfonic Acid Monomer <b>8) Abdullah BaSalem</b>

Characterization of Gemini Surfactants as they Form Micelles and Interact with Oppositely Charged Surfactants

**9) Sanjay Patel**

Sensitivity and Selectivity of Fluorescent Sensors Prepared with Pyrene-Labeled Starch Nanoparticles

**10) Joanne Fernandez**

Poly(Acrylic Acid)-Modified Starch by Cerium (IV)-Promoted Grafting

12:00 - 1:00

**Lunch**

1:00 - 1:40

**Industry Speaker Dr. Anna Mathew from Dupont**  
**DuPont's Renewably Sourced High-Performance Polyamides**

1:40 – 2:00

**Damin Kim**

Surfactant-Induced Stabilization of Hydrophobically Modified Starch Nanoparticles Probed by Fluorescence

2:00 – 2:20

**Remi Casier**

Dynamics and Conformation of Polypeptides Probed by Pyrene Excimer Formation

2:20 - 2:40

**Jenner Ngai, Chemical Engineering, Waterloo**

Design, Synthesis and Sensor Applications of Electrically Conducting/Semiconducting  $\pi$ -Conjugated Polymers

**(Winner of 2018 IPR Award for Academic Excellence in Polymer Science/Engineering)**

2:40 - 3:00

**Zehou You**

Enhanced Diffusion in Latex Films Induced by Oligomers and Characterized by Pyrene Excimer Fluorescence

3:00 - 3:20

**Pankaj Kumar**

Evaluating new materials for organic solar cells

3:20 - 3:40

Coffee

**Jingqi Wang**

3:40 – 4:00

Oligomerization of Oligophenylvinylene-Labeled Oligoquinoline Foldamers Investigated by Time-Resolved Fluorescence Anisotropy

4:00 - 4:20

**Silu Chen**

PEBAX/PVAm based membranes for carbon capture

4:20 - 4:40

**Aaron Leung**

Exclusive synthesis of macrocycles by suppressing intramolecular cyclization via migration insertion polymerization

4:40 - 5:00

**Noushin Majdabadifarahani**

Evaluating polymeric materials as potential sensing materials for gaseous analytes

5:00

**Closing remarks**

6:00 - 7:30

**IPR Industrial Member DINNER**

University Club, Main Dining Room

7:30 - 9:00

**Poster Presentations and Informal Get-together**

University Club, Main Dining Room

(IPR graduate students/researchers and symposium participants)

Poster presentations follow on next page

**INSTITUTE FOR POLYMER RESEARCH  
 FORTIETH ANNUAL SYMPOSIUM  
 ON POLYMER SCIENCE/ENGINEERING 2019  
 POSTER SESSION  
 WEDNESDAY, MAY 8, 2019  
 University Club**

Sarah Mathers Chemistry, Waterloo	Synthetic Route to Conjugated Thiophene-S,S-Dioxide-Based Polymers
Joanna Jardin Chem. Eng., Waterloo	Antimicrobial Latex for Medical Applications
Rafael Mirabal Chemistry, Waterloo	Palladium Precatalyst for Direct Arylation Polymerization
Hunter Little Chemistry, Waterloo	Radical Simplification of the Experimental Set-up for Time-Resolved Fluorescence Anisotropy
Malin Ly Chem. Eng., Waterloo	Cellulose Nanocrystals Reinforced Epoxy for Metal Corrosive Protection
Franklin Frasca Chemistry, Waterloo	Application of Pyrene Excimer Fluorescence to Characterize the Chemical Composition of Polyamines
Donghan Liu Chemistry, Waterloo	Controlled Ethoxylation of Pyrenemethanol and Other Alcohols by Anionic Polymerization of Ethylene oxide
Zhifang Zhang Chem. Eng., Waterloo	Evaluating new active layer materials for organic solar cells
Noushin Majdabadifarahani Chem. Eng., Waterloo	Evaluating polymeric materials as potential sensing materials for gaseous analytes

**THIRTY-EIGHTH ANNUAL SYMPOSIUM  
ON POLYMER SCIENCE/ENGINEERING  
May 8, 2019--CONRAD GREBEL COLLEGE**

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THIRTY-EIGHTH ANNUAL SYMPOSIUM  
ON POLYMER SCIENCE/ENGINEERING  
May 3, 2017--CONRAD GREBEL COLLEGE

LIST OF ORAL AND POSTER PRESENTERS

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**INDUSTRIAL GUEST SPEAKER**

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**INDUSTRIAL GUEST SPEAKER**

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Tel: 905-814-8923

- 19-001      **Synthesis of isoprenic polybutadiene macromonomers for the preparation of branched polybutadiene**  
V. Deepak and M. Gauthier  
European Polymer Journal. 01/19
- 19-002      **Enhanced asphalt performance upon addition of RAFT-synthesized reactive multi-block copolymers**  
J. Benvenuta\_Tapia, E. Vivaldo-Lima, A. Martinez-Estrada, M. Hernandez Valdez S. Paredes-Castenda, and C. Ramos-Valdes  
Materials Chemistry and Physics. 02/19
- 19-003      **Modelling Permeation Passive Sampling with Various Types of Adsorbents: Intra-Particle Resistance to Mass Transfer and Comprehensive Sensitivity Analysis**  
F. Salim, M. Ioannidis, A. Penlidis, and T. Gorecki  
Env Sci Proc & Impacts. 02/19
- 19-004      **TAILOR-MADE CONTROLLED RHEOLOGY POLYPROPYLENES FROM METALLOCENE AND ZIEGLER-NATTA RESINS**  
S. Nie and C. Tzoganakis  
Polymer Engineering and Science. 02/19
- 19-005      **Probing the Interactions between Mimics of Pour Point Depressants (PPDs) and Viscosity Index Improvers (VIIs) in Engine Oil Using Fluorescently Labeled PPDs**  
K. Gholami, S. Jiang and J. Duhamel  
Macromolecules. 03/19
- 19-006      **Viscoelastic Properties of Crosslinked Chitosan Films**  
J. Khouri, A. Penlidis, C. Moresoli  
Processes. 03/19
- 19-007      **Intelligent Machine Learning: Tailor-making Macromolecules**  
Y. Mohammadi, M. Reza Saeb, A. Penlidis, E. Jabbari, Fl. Sandler, P. Zinck, K. Matyjaszewski  
Polymers 03/19
- 19-008      **Terpolymerization of Triisopropylsilyl Acrylate, Methyl Methacrylate and Butyl Acrylate: Reactivity Ratio Estimation**  
F. K. Yousefi, A. Jannesari, S. Pazokifard, M. Reza Saeb, A. Scott, and A. Penlidis  
Macromol. React. Eng. 05/19

- 19-009      **Biotemplated synthesis of cellulose nanocrystal@PVP-assisted polydopamine@Ag nanoparticle as conductive composites**  
L. Chen, P. Si and B. Zhao  
Journal of Materials Science: Materials in Electronics. 05/19
- 19-010      **The Role of pH, Ionic Strength and Monomer Concentration on the Terpolymerization of 2-Acrylamido-2-methylpropane Sulfonic Acid, Acrylamide and Acrylic Acid**  
A. Scott, T. Duever, A. Penlidis  
Polymer. 06/19
- 19-011      **Modeling of the Free Radical Copolymerization Kinetics of n-Butyl Acrylate, Methyl Methacrylate and 2-Ethylhexyl Acrylate Using PREDICI®**  
J. Gómez-Reguera, E. Vivaldo-Lima, V. Gabriel, and M. Dubé,  
Processes. 06/19
- 19-012      **Making the Most of Parameter Estimation: Terpolymerization Troubleshooting Tips**  
A. Scott, V. Gabriel, M. Dubé and A. Penlidis  
Processes. 07/19
- 19-013           **Application of Time-Resolved Fluorescence Anisotropy to Probe Quinoline-Based Foldamers Labeled with Oligo(phenylene-vinylene)**  
J.Wang, H. Little, J. Duhamel, X. Li, M. Nagula, V. Maurizot, and I. Huc  
Macromolecules. 07/19
- 19-014           **Effect of copolymers synthesized by nitroxide mediated polymerization as chain extenders of postconsumer poly(ethylene terephthalate) waste**  
J.Benvenuta-Tapia, E. Vivaldo-Lima, R. Guerrero-Santos  
Polymer Engineering & Science. 09/19
- 19-015      **Aromatic Embrace Motifs for Bulk Supramolecular Polymers**  
N. Lanigan, A. Assoud, W. Zhang, and X. Wang  
Chemistry. 09/19
- 19-016      **Detection of Nitroaromatics by Pyrene-Labeled Starch Nanoparticles**  
S. Patel, J. Seet, L. Li, J. Duhamel  
Langmuir. 09/19
- 19-017      **Evaluation of Doped and Undoped Poly (o-anisidine) as Sensing Materials for a Sensor Array for Volatile Organic Compounds**  
K. Stewart, A. Scott, and A. Penlidis  
Polymers for Advanced Technologies. 09/19

- 19-018      **Heterogeneous Method of Chitosan Film Preparation: Effect of Multifunctional Acid on Film Properties**  
J. Khouri, A. Penlidis and C. Moresoli  
Journal of Applied Polymer Science. 09/19
- 19-019      **New Aspects on the Modeling of Dithiolactone-Mediated Radical Polymerization of Vinyl Monomers**  
AN. Benitez-Carreon, J. Soriano-Moro, E. Vivaldo-Lima, R. Guerrero-Santos, and A. Penlidis  
Processes. 11/19
- 19-020      **Simplification in the Acquisition and Analysis of Fluorescence Decays Acquired with Polarized Emission for Time-Resolved Fluorescence Anisotropy Measurements**  
H. Little, J. Wang, J. Duhamel, X. Li, N. Markandeya, V. Maurizot, I. Huc  
Analytical Chemistry 12/19

**APPENDIX 4**
**Research Personnel (SUPERVISOR)**

NAME	C A T	DEPT	JD	RD	XF	MG	YL	TM	AP	DS	MT	CT	XW	BZ	THESIS/PROJECT TOPIC	COMPL. DATE
M. Abd-Ellah	3	ChE					x								Polymer solar cell fabrication	Aug 20
S. Abuadas	1	CHEM								X					Iterative Oxidation/Dehydration Strategy to Access Well-Defined Large Conjugated Molecules	June 19
S. Alharthi	2	CHE									X				Functionalized cellulose nanocrystals for waste water treatment	Dec 20
F. Alsaadi	1	ChE			x										Water desalination	Dec 20
P. Ataeian	2	CHE									X				Bioflocculant using sustainable nanomaterials	Aug 20
J. Baek	2	CHE									X				Double Pickering emulsions using modified CNC in food products	Aug 20
L. Bauman	2	CHE											X		Poly(N-isopropylacrylamide) grafted PDMS micropillars enabling smart switchable wettability	Aug 21
J. Buratynski	1	CHEM								X					Oxidative Depolymerization of Conjugated Polymers	
X. Cao	2	ChE			x										Phenolic compound removal from wastewater	Aug 21
R. Casier	2	ChEM	X			X									Probing Polypeptide Folding by Pyrene Excimer Formation	June 20
C. Chen	1	ChE			x										Wastewater treatment by membrane and adsorption	Dec 21
S. Chen	2	ChE			x										Membranes for gas separations	Mar 20
N. Dasgupta	2	CHEM				X									Thermoresponsive Starch Nanoparticles for Tar Sands Oil Extraction	Apr. 21
C. Dutchmann	1	ChE									X				Antimicrobial systems	
H. Eslam	3	ChE										X			Processing Properties of Surface Modified Cellulose Nanocrystals	<b>Dec 20</b>
E. Esmizadeh	3	ChE										X			Wood-plastic composites based on recycled polyolefins	<b>Dec 20</b>
M.U. Farooq	4	ChE										X			TPV Production From Devulcanized Rubber	<b>Dec 20</b>
J. Fernandez	2	CHEM				X									Grafting of Starch Nanoparticles	Aug. 20
N. Francis	1	ChE							X						Terpolymers of acrylamide for Enhanced Oil Recovery	May 21
F. Fransca	1	CHEM	X												Characterization of PIBSA-Based Dispersants by Pyrene Excimer Fluorescence	Aug 20
X. Gao	2	ChE					x								Designing 3D Crosslinked Polymer Binders for High Energy Density and Long Cycle Life Lithium-Sulfur Batteries	Ari 21
N. Grishkewich	2	CHE									X				Sustainable nanomaterials for development of water treatment systems	April 19
C. Guo	1	ChE					x								Functional polymers for lithium sulfur batteries	Aug 20
K. He	3	ChE					x								Polymers for solar cells	Apr 21

NAME	C A T	DEPT	JD	RD	XF	MG	YL	TM	AP	DS	MT	CT	XW	BZ	THESIS/PROJECT TOPIC	COMPL. DATE
T. Hussain	1	ChE							X						Biopolymer applications	May 22
J. Jardin	1	ChE									X				Antimicrobial rubber gloves	
Y. Jiang	1	ChE					x								Polymers for organic solar cells	Aug 21
D. Jubinville	2	ChE										X			Compounding of Lignocellulosic Materials at High Loadings into Recycled Polymers for Over-molding and Compression Molding Applications	Sep 23
P. Kumar	2	ChE					x								Optimizing polymer solar cell fabrication	Aug 22
A. Kim	2	CHE												X	soft contact dynamics for sliding and confined flow	Aug 22
D. Kim	2	CHEM	X												Characterization of Polysaccharides by Fluorescence	Dec 20
D. Sung Kim	1	CHE									X				Functional cellulose for the treatment of se lice in salmon	
M. Kulak	2	CHEM								X					Simultaneous Sorting and Alignment of Single-Walled Carbon Nanotubes	
Y. Lee	2	CHE									X				Conductive cellulose nanocrystals	
W. Li	1	ChE					x								Development of functional polymers for sensors	Aug 20
Z. Li	2	ChE			x										Membranes for gas separations	Aug22
H. Little	1	CHEM	X												Chain Dynamics of Polar Polymers Probed in DMSO and DMF by Pyrene Excimer Fluorescence	Dec 22
D. (A.) Liu	1	CHEM	X			X									Synthesis and Characterization of Non-Ionic Surfactants Prepared from Furan-2-methanol Derivatives	Aug. 20
J. Liu	4	ChE			x										Mass transport in membranes	Dec 20
M. Liu	1	CHE												X	Fabrication and Characterization of Polyurethane Film”	Aug 21
K. Lulic	1	CHEM	X												Self-Assembly of Phenylene Vinylene Oligomers in Solution Probed by Fluorescence Anisotropy	Aug 21
S. Mathers	1	CHEM								X					Directed Oxidations to Access Highly Oxidized Conjugated Materials	
B. Mavani	1	ChE							X						GC detection of gaseous analytes in ppm/ppb levels	Aug 21
R. Mirabal	2	CHEM								X					Catalyst Design for Direct Arylation Polymerization	
S. Muralidharan	1	CHE												X	Sulphonated polyetheretherketone (SPEEK)-Copper films for antimicrobial applications	Aug 20
J. Ngai	2	ChE					x								Low-cost Amide-based Donor-acceptor Polymers for Organic Electronic Devices	Dec 20
R. Ngunijri	1	ChE										X			UV treatment of plastic films	May 20
E. Ojogbo	2	ChE						X				X			Starch modification for sustainable and functional material applications	Jan 19

NAME	C A T	DEPT	JD	RD	XF	MG	YL	TM	AP	DS	MT	CT	XW	BZ	THESIS/PROJECT TOPIC	COMPL. DATE
S. Patel	2	CHEM	X												Probing the structure of Complex polypeptide Architectures with Pyrene Excimer Fluorescence	Aug 23
D. Pereira	4	CHEM				X									Polymer Monoliths for DNA Separation	Sep. 20
J. Polena	1	ChE					x								Polymers fro chemical sensors	Aug 21
S. Saikrishnan	1	ChE										X			Fabrication of thin structured Wood-Plastic Composites	May 21
A. Saikia	4	ChE										X			Rubber Devulcanization in a twin-screw extruder	Dec 20
A. Scott	3	ChE							X						Rational design of polymeric materials for specific applications	Dec 20
S. Selmain	2	CHEM								X					Simultaneous Sorting and Alignment of Single-Walled Carbon Nanotubes	
C. Seto	1	ChE										X			Pyrolysis of cellulose nanocrystals (CNC) and lignin for use in composite blends with rubber	Sept 21
P. Si	2	CHE												X	Conductive polymer composites as interconnect materials for advanced electronics	Apr 20
M. Shahidul Islam	2	CHE									X				Cellulose nanocrystals for biomedical applications	
Geoffrey Sinclair	2	CHEM								X					Copper Mediated Tandem C-H Bond Functionalization/C-S Bond Formation	
C. Tang	2	CHE									X				Cellulose nanocrystals for agriculture applications	
J. Thoma	2	CHEM	X												Characterization of Polymeric Bottlebrushes by Pyrene Excimer Fluorescence	Dec 20
E. Vivaldo-Lima	6	ChE							X						Mathematical modelling of grafting of synthetic and natural polymers	Aug 20
G. Wang	1	ChE					x								Development of low cost polymer semiconductors for solar cells	Aug 20
H. Wang	2	ChE			x										VOC capture from gas streams by membranes	Dec 21
J. Wang	2	CHEM								X					Synthesis of Cyclacene	
J.-Z. Wang	1	CHEM				X									Synthesis of Arborescent Poly(benzyl glutamate)-co-Polylysine Drug Delivery systems	Apr. 21
S. Wang										X					Magnetic Fields Applied to the Alignment Relay Technique	
A. Worku	2	CHEM				X									Arborescent Micelles from Polyelectrolyte Complexes	Aug. 20
G. Xi	3	ChE					x								Polymer electrolytes for batteries	Apr 21
J. Xu	2	CHE									X				Functional magnetic nanoparticles for water treatment applications	Aug 20
F. Yang	2	CHE												X	Universal Bonding of Hydrogels Through an Engineered Interfacial Layer	
Z. Yin	1	ChE					x								Polymers for organic solar cells	Aug 21
Y. Yuan	1	ChE					x								Polymers for organic solar cells	Dec 20
X. Zhang	4	ChE										X			Evaluation Of Devulcanized Rubber Properties	Dec 20

1 = MASC 2 = PhD 3 = Postdoctoral Fellow 4 = Res. Associate 5 = Technician

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MT=M. Tam CT=C. Tzoganakis XW=X.Wang BZ=B. Zhao

1 = MASC 2 = PhD 3 = Postdoctoral Fellow 4 = Res. Associate 5 = Technician

TD=T.A. Duever JD=J. Duhamel RD=R. Dhib XF=X. Feng JF=J.Forrest MG=M. Gauthier YL=Y.Li  
NMc=N. McManus AP=A. Penlidis

MT=M. Tam CT=C. Tzoganakis XW=X.Wang BZ=B. Zhao