

# Jesse T. E. Quinn

ORGANIC ELECTRONICS · CHEMISTRY · THEORETICAL CHEMISTRY

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“Everything is theoretically impossible, until it is done.” - Robert A. Heinlein

## Summary

Highly self-motivated PhD with an interdisciplinary background in conjunction with a demonstrated research prowess in the field of organic electronics and polymeric semiconductor chemistry. With a rich experience in experimental techniques, and computation modelling along with strong interpersonal skills.

## Education

### University of Waterloo

PHD IN CHEMICAL ENGINEERING (NANO)

Waterloo, Canada

2013 - 2017

- Synthesis and characterization of novel semiconductive polymers for use in organic thin film transistors (OTFTs)
- Computational studies employing density functional theory (DFT) calculations
- Fabrication and characterization of OTFTs as bio- and chemosensors

### Ryerson University

MSc IN MOLECULAR SCIENCE

Toronto, Canada

2010 - 2013

Investigation and study of monomers and polymers based on known metal induced couplings of alkynes and diynes

### Ryerson University

BSc IN CHEMISTRY

Toronto, Canada

2005 - 2010

Towards the synthesis of inverse crown metal containing macrocycles based on zirconocene-coupling of diynes

### Seneca College

COMPUTER PROGRAMMING AND ANALYSIS (WEB DESIGN & SOFTWARE DEVELOPMENT)

Toronto, Canada

2000 - 2004

- Computer programming and analysis program
- Rigorous study of web programming languages, server side development, database maintenance, and object oriented methodologies

## Published Works

## Highlights

1. A Super Electron Deficient Polymer. *Synfacts* **2016**, 12 (04), 0357-0357.

## Papers Containing Acknowledgements

1. Manipulating mammalian cell morphologies using chemical-mechanical polished integrated circuit chips. *Sci. Technol. Adv. Mater.* **2017**, 18 (1), 839-856.

## Publications

**28.** He, Y.<sup>1</sup>; Quinn, J.<sup>1</sup>; Hou, D.<sup>1</sup>; Ngai, J. H. L.; Li, Y. A small bandgap (3*E*,7*E*)-3,7-bis(2-oxoindolin-3-ylidene)benzo[1,2-*b*:4,5-*b'*]difuran-2,6(3*H*,7*H*)-dione (IBDF) based polymer semiconductor for near-infrared organic phototransistors. *J. Mater. Chem. C* **2017**, 5 (46), 12163-12171. <sup>1</sup>equal contribution.

**27.** Bura, T.; Beaupré, S.; Ibraikulov, O. A.; Légaré, M.-A. Quinn, J.; Lévêque, P.; Heiser, T.; Li, Y.; Leclerc, N.; Leclerc, M. New Fluorinated Dithienyldiketopyrrolopyrrole Monomers and Polymers for Organic Electronics. *Macromolecules* **2017**, 50 (18), 7080-7090.

**26.** Quinn, J. T. E.; Haider, F.; Patel, H.; Khan, D. A.; Wang, Z. Y.; Li, Y. Ultrafast photoresponse organic phototransistors based on pyrimido[4,5-*g*]quinazoline-4,9-dione polymer. *J. Mater. Chem. C* **2017** 5 (34), 8742-8748.

- 25. Quinn, J. T. E;** Zhu, J.; Li, X.; Wang, J.; Li, Y. Recent progress in the development of n-type organic semiconductors for organic field effect transistors. *J. Mater. Chem. C* **2017**, 5 (34), 8654-8681.
- 24.** He, Y.; **Quinn, J.**; Lee, S.; Wang, G. Y.; Li, X.; Wang, J.; Li, Y. An aromatic amine-containing polymer as an additive to ambipolar polymer semiconductor realizing unipolar n-type charge transport. *Org. Electron.* **2017**, 49 (October 2017), 406-414.
- 23. Quinn, J.**<sup>1</sup>; Guo, C.<sup>1</sup>; Haider, F.; Patel, H.; Khan, D. A.; Li, Y. Regioisomerism of alkyl-substituted bithiophene comonomer in (3*E*,8*E*)-3,8-bis(2-oxoindolin-3-ylidene)naphtho-[1,2-*b*:5,6-*b'*]difuran-2,7(3*H*,8*H*)-dione (INDF) based D-A polymers for organic thin film transistors. *J. Mater. Chem. C* **2017**, 5 (24), 5902-5909.<sup>1</sup>equal contribution.
- 22.** Le Borgne, M.; **Quinn, J.**; Martín, J.; Stingelin, N.; Li, Y.; Wantz, G. New 3,3'-(ethane-1, 2-diylidene)bis(indolin-2-one) (EBI)-based small molecule semiconductors for organic solar cells. *J. Mater. Chem. C* **2017**, 5 (21), 5143-5153.
- 21.** Bura, T.; Beaupre, S.; Legare, M.; **Quinn, J.**; Blaskovits, T.; Rochette, E.; Fontaine, F.; Pron, A.; Li, Y.; Leclerc, M. Direct Heteroarylation Polymerization: Guidelines for Defect-Free Conjugated Polymers. *Chem. Sci.* **2017**, 8 (5), 3913-3925.
- 20.** Blaskovits, J. T.; Bura, T.; Beaupré, S.; Lopez, S. A.; Roy, C.; de Goes Soares, J.; Oh, A.; **Quinn, J.**; Li, Y.; Aspuru-Guzik, A.; et al. A Study of the Degree of Fluorination in Regioregular Poly(3-hexylthiophene). *Macromolecules* **2017**, 50 (1), 162-174.
- 19. Quinn, J.**; Patel, H.; Haider, F.; Khan, D.; Li, Y. Converting a semiconducting polymer from ambipolar into n-type dominant by amine end-capping. *Chemelectrochem* **2016**, 4 (2), 256-260.
- 18. Quinn, J.**; He, Y.; Khan, D.; Rasmussen, J.; Patel, H.; Haider, F.; Kapadia, W.; Li, Y. Synthesis, characterization, and air stability study of pyrimido[4,5-*g*]quinazoline-4,9-dione-based polymers for organic thin film transistors. *RSC Adv.* **2016**, 6 (82), 78477-78485.
- 17.** Guo, C.; **Quinn, J.**; Sun, B.; Li, Y. Dramatically Different Charge Transport Properties of Bisthienyl Diketopyrrolopyrrole-Bithiazole Copolymers Synthesized via Two Direct (Hetero)arylation Polymerization Routes. *Poly. Chem.* **2016**, 7 (27), 4515-4524.
- 16.** Guo, L.<sup>1</sup>; **Quinn, J.**<sup>1</sup>; Wang, J.; Guo, C.; Wang, J.; Li, X.; Li, Y. A fluorene-fused triphenodioxazine (FTPDO) based polymer with remarkable thermal stability and significantly enhanced charge transport performance in air. *Dyes Pigm.* **2016**, 132 (September 2016), 329-335. <sup>1</sup>equal contribution.
- 15.** He, Y.; **Quinn, J.**; Deng, Y.; Li, Y. 3,7-Bis((*E*)-1-methyl-2-oxoindolin-3-ylidene)-3,7-dihydrobenzo[1,2-*b*:4,5-*b'*]dithiophene-2,6-(IBDT) based polymer with balanced ambipolar charge transport performance. *Org. Electron.* **2016**, 35 (August 2016), 41-46.
- 14.** Deng, Y.; Sun, B.; **Quinn, J.**; He, Y.; Ellard, J.; Guo, C.; Li, Y. Thiophene-*S,S*-dioxidized indophenines as high performance n-type organic semiconductors for thin film transistors. *RSC Adv.* **2016**, 6 (51), 45410-45418.
- 13.** Le Borgne, M.; **Quinn, J.**; Martin, J.; Stingelin, N.; Wantz, G.; Li, Y. Synthesis and properties of a novel narrow band gap oligomeric diketopyrrolopyrrole-based organic semiconductor. *Dyes Pigm.* **2016**, 131 (August 2016), 160-167.
- 12.** Deng, Y.; **Quinn, J.**; Sun, B.; He, Y.; Ellard, J.; Guo, C.; Li, Y. Thiophene-*S,S*-dioxidized indophenine (IDTO) based donor-acceptor polymers for n-channel organic thin film transistors. *RSC Adv.* **2016**, 6 (41), 34849-34854.
- 11. Quinn, J.**; Guo, C.; Ko, L.; Sun, B.; He, Y.; Li, Y. Pyrazino[2,3-*g*]quinoxaline-2,7-dione based  $\pi$ -conjugated polymers with affinity towards acids and semiconductor performance in organic thin film transistors. *RSC Adv.* **2016**, 6 (26), 22043-22051.
- 10.** Deng, Y.; Sun, B.; He, Y.; **Quinn, J.**; Guo, C.; Li, Y. Thiophene-*S,S*-dioxidized Indophenine: A Quinoid-type Building Block with High Electron Affinity for Constructing n-Type Polymer Semiconductors with Narrow Band Gaps. *Angew. Chem. Int. Ed.* **2016**, 55 (10), 3459-3462.
- 9. Quinn, J.**; Guo, C.; Sun, B.; Chan, A.; He, Y.; Jin, E.; Li, Y. Pyrimido[4,5-*g*]quinazoline-4,9-dione as a new building block for constructing polymer semiconductors with high sensitivity to acids and hole transport performance in organic thin film transistors. *J. Mater. Chem. C* **2015**, 3 (45), 11937-11944.
- 8.** Guo, C.; **Quinn, J.**; Sun, B.; Li, Y. Regioisomeric control of charge transport polarity for indigo-based polymers. *Polym. Chem.* **2015**, 6 (39), 6998-7004.
- 7.** Deng, Y.; Sun, B.; He, Y.; **Quinn, J.**; Guo, C.; Li, Y. (3*E*,8*E*)-3,8-Bis(2-oxoindolin-3-ylidene)naphtho-[1,2-*b*:5,6-*b'*]difuran-2,7(3*H*,8*H*)-dione (INDF) based polymers for organic thin-film transistors with highly balanced ambipolar charge transport characteristics.

*Chem. Commun.* **2015**, 51 (70), 13515-13518.

6. He, Y.; Guo, C.; Sun, B.; **Quinn, J.**; Li, Y. Branched alkyl ester side chains rendering large polycyclic (3*E*,7*E*)-3,7-bis(2-oxoindolin-3-ylidene)benzo[1,2-*b*:4,5-*b'*]difuran-2,6(3*H*,7*H*)-dione (IBDF) based donor-acceptor polymers solution-processability for organic thin film transistors. *Polym. Chem.* **2015**, 6 (37), 6689-6697.

5. Shahsavan, H.; **Quinn, J.**; d'Eon, J.; Zhao, B. Surface modification of polydimethylsiloxane elastomer for stable hydrophilicity, optical transparency and film lubrication. *Colloids Surf., A* **2015**, 482, 267-275.

4. Guo, C.; **Quinn, J.**; Sun, B.; Li, Y. An indigo-based polymer bearing thermocleavable side chains for n-type organic thin film transistors. *J. Mater. Chem. C* **2015**, 3 (20), 5226-5232.

3. He, Y.; Guo, C.; Sun, B.; **Quinn, J.**; Li, Y. (3*E*,7*E*)-3,7-Bis(2-oxoindolin-3-ylidene)-5,7-dihydropyrrolo[2,3-*f*]indole-2,6(1*H*,3*H*)-dione based polymers for ambipolar organic thin film transistors. *Chem. Commun.* **2015**, 51 (38), 8093-8096.

2. **Quinn, J.**; Jin, E.; Li, Y. New synthetic route to pyrimido[4,5-*g*]quinazoline-4,9-diones. *Tetrahedron Lett.* **2015**, 56 (17), 2280-2282.

1. Guo, C.; Sun, B.; **Quinn, J.**; Yan, Z.; Li, Y. Synthesis and properties of indigo based donor-acceptor conjugated polymers. *J. Mater. Chem. C* **2014**, 2 (21), 4289-4296.

## Conferences and Seminars

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### Invited Talk, Universidade de São Paulo, A Escola de Engenharia de Lorena

Lorena, Brazil

ORAL PRESENTATION

Nov 2017

Novel organic semiconductors and their evaluation in organic thin film transistors and phototransistors

### SBPMat XVI - MRS Meeting

Gramado, Brazil

ORAL PRESENTATION

Sep 2017

Novel robust organic semiconductors for organic thin film transistors

### SBPMat XVI - MRS Meeting

Gramado, Brazil

ORAL PRESENTATION

Sep 2017

Unipolarization of ambipolar organic thin film transistors

### Invited Talk, Universidade de São Paulo, Instituto de Física de São Carlos

São Carlos, Brazil

ORAL PRESENTATION

Jun 2017

Novel semiconductive materials for organic thin film transistors

### Institute of Polymer Research (IPR) 2017

Waterloo, Canada

ORAL PRESENTATION

May 2016

Nature-inspired polymers: Promising materials for organic thin film transistor-based sensors

### Laboratório Nacional de Nanotecnologia (LNNano)

Campinas, Brazil

SEMINAR PRESENTATION

Dec 2016

Novel semiconductive materials for organic thin film transistors

### Nano Ontario Conference

Guelph, Canada

POSTER

Nov 2016

Air stability study of novel pyrimido[4,5-*g*]quinazoline-4,9-dione-based polymers for organic thin film transistors

### Institute of Polymer Research (IPR) 2016

Waterloo, Canada

PRESENTATION AND POSTER

Mar 2016

The synthesis and properties of pyrazino[2,3-*g*]quinoxaline-2,7-dione and pyrimido[4,5-*g*]quinazoline-4,9-dione based conjugated polymers and application in organic thin film transistors

### WINGSS/MNS Nanotechnology Poster Session

Waterloo, Canada

POSTER

May 2016

Synthesis and properties of pyrimido[4,5-*g*]quinazoline-4,9-dione based  $\pi$ -conjugated polymers

### Waterloo Undergraduate Nanotechnology Conference

Waterloo, Canada

POSTER

Nov 2015

Pyrimido[4,5-*g*]quinazoline-4,9-dione as a novel building block for channel semiconductors in organic thin film transistors

### 98<sup>th</sup> Canadian Chemistry Conference and Exhibition

Ottawa, Canada

POSTER

Jun 2015

Synthesis and properties of pyrimido[4,5-*g*]quinazoline-4,9-dione based  $\pi$ -conjugated polymers

## 94<sup>th</sup> Canadian Chemistry Conference and Exhibition

POSTER PRESENTED BY DR A. MCWILLIAMS

In situ polymerization of *N*-silylsulfonimidoyl chlorides: a Lewis acid catalyzed route to poly(oxothiazenes)s

Montreal, Canada

Jun 2011

## 43<sup>rd</sup> Inorganic Discussion Weekend

POSTER

Lewis acid catalyzed in situ polymerization of *N*-silylsulfonimidoyl chlorides: an ambient temperature route to poly(oxothiazenes)s

Windsor, Canada

Nov 2010

## 93<sup>rd</sup> Canadian Chemistry Conference and Exhibition

POSTER

Towards the synthesis of inverse crown metal containing macrocycles based on zirconocene coupling of diynes

Toronto, Canada

Jun 2010

## 92<sup>nd</sup> Canadian Chemistry Conference and Exhibition

POSTER

Synthesis of poly(oxothiazenes) *via* the polycondensation of *N*-silylsulfonimidoyl chlorides

Hamilton, Canada

May 2010

## Experience

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### Dr Osvaldo Novais de Oliveira, University of Sao Paulo

POST-DOCTORAL FELLOWSHIP

- Synthesis
- Sensing and characterization

São Carlos, Brazil

2017-present

### Dr Boxin Zhao, University of Waterloo

VISITING SCHOLAR

- Synthesis of acrylic pressure sensitive adhesives.
- Surface modification of polydimethylsiloxane (PDMS).

Waterloo, Canada

2012 - 2013

### Opalux Inc.

RESEARCHER

- Supported the development of P-INK device (Electrically Active Colour-Based Battery Tester).
- Helped with technical problems with other product lines.
- Synthesized nano particles on demand.
- Developed and constructed an electronic voltage tuner (potentiometer) for P-INK device.
- Responsible for the design, construction and maintenance of company website.

Toronto, Canada

Feb - Jul 2009

### Ministry of Environment

DATA ANALYST

- Analyzed past data for outliers for the drinking water survey program (DWSP).
- Corrected outliers when possible with actual raw data.
- Compiled past data into the appropriate reports.
- Supported the DWSP questionnaire (*i.e.* contacted and requested information from all participating drinking water works.)

Toronto, Canada

Sep - Dec 2008

### Dr A. McWilliams, Ryerson University

RESEARCHER

- Supported the development of polymer precursors.
- Synthesized several analog precursors.
- Utilized the computational chemistry program HyperChem in the construction of precursors.

Toronto, Canada

May - Aug 2008

## Honors & Awards

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2017 **Awarded**, FAPESP

2017 **Awarded**, IPR Award

2016 **Awarded**, WIN Nano Fellowship

2015 **Awarded**, WIN Nano Fellowship

2013-2017 **Awarded**, Waterloo Graduate Research Scholarship

2010-2013 **Awarded**, Ryerson Graduate Scholarship

São Carlos, Brazil

Waterloo, Canada

Waterloo, Canada

Waterloo, Canada

Waterloo, Canada

Toronto, Canada

## Skills

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<b>Programming</b>	Bash, C/C++, JAVA, LaTeX, Perl, Python, Ruby
<b>Web</b>	Apache, CSS, HTML5, Markdown, PHP, XML
<b>Database</b>	MySQL, Postgres
<b>Graphics</b>	Abode Illustrator, Abode Photoshop
<b>Plotting</b>	Datagraph, Excel, MATLAB, Mathematica, Origin Pro
<b>Technical Instrument</b>	AFM, CV, DSC, GPC, I-V source measuring unit, MS, NMR, TGA, UV-Vis spectroscopy, reflectance mode XRD
<b>Computational Software</b>	GAMESS, Gaussian, Spartan
<b>Supervisorial</b>	Supervised co-op students and graduate students, and managed laboratory safety and implementation.
<b>Languages</b>	English ( <i>mother tongue</i> ), Spanish ( <i>elementary</i> ), Portuguese ( <i>elementary</i> ) and Mandarin Chinese ( <i>beginner</i> )

## Graduate Courses

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UNIVERSITY OF WATERLOO

2013 - 2017

- Microscopy
- Nano-fabrication and tools
- Polymer synthesis and characterization
- X-Ray diffraction principles

RYERSON UNIVERSITY

2010 - 2013

- Advanced NMR characterization
- Ceramic membranes
- Molecular recognition
- Mass spectrometry principles
- Membrane technology
- Water filtration processes and technologies