

Contact

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Skills

Experimental

Spectroscopy and optics

Ellipsometry

Electrical characterization

Transient luminescence

Arduino, electronic circuit design

Atomic force microscopy

Optical microscopy

X-ray diffraction

Physical vapor deposition

Programming and Modeling

Thin film optical modeling

Python, MATLAB

LabView

Test automation, Data Acquisition

Image processing

Git

Leadership and Outreach

Research Mentor

UMN and MSU | 2014–Present

Mentored three graduate students and five undergraduates, leading to work in five publications

Science Fair Mentor

Minnesota Academy of Science

Bdote Middle School | Fall 2018

Workshop Volunteer

Minnesota Tool Library

May 2017–Present

Student Chapter President

Engineers Without Borders, MSU

May 2014–May 2015

John Bangsund

Optical and Electronic Materials Scientist

About

I have eight years of laboratory and modeling experience in materials science, with expertise in developing scientific software and hardware for new measurement techniques, modeling, and data analysis. During my PhD work, I applied these techniques to better understand what limits the efficiency and reliability of organic LEDs. Going forward, I hope to develop advanced materials and optoelectronic devices which reduce our impact on the environment.

Education

Ph.D. in Materials Science

2015–June 2020

University of Minnesota | GPA: 3.9

National Science Foundation Graduate Research Fellowship (2015-2020)

UMN College of Science and Engineering Fellowship (2015-2020)

B.S. in Materials Science & Engineering

2011–2015

Michigan State University | GPA: 4.0

Concentration in Polymer Science, B.A. in Humanities, Minor in Spanish

Goldwater Scholarship (2014), Alumni Distinguished Scholarship (2011-2015)

Work Experience

Graduate Research Fellow

Nov. 2015–Present

University of Minnesota | Advised by Prof. Russell Holmes

- Collaborated with Dow and DuPont to characterize OLED degradation and explain stability differences between proprietary host materials
- Developed optical and electrical measurements to identify the mechanisms of degradation and factors which limit lifetime of OLEDs
- Implemented models for optical absorption, outcoupling, and excited state dynamics in OLEDs to describe efficiency roll-off and lifetime test data
- Developed a self-assembly approach for forming sub-micron gratings in organic thin films for use as photonic structures in OLEDs and lasers
- Explained self-assembly mechanism using AFM and *in situ* microscopy
- Managed laboratory equipment maintenance on deposition system, vacuum pumps, and gloveboxes

Ellipsometry Technician

Oct. 2016–Jan. 2020

UMN Characterization Facility | Minneapolis, MN

- Trained over 40 new users in theory and the principles of operation
- Maintained instrument and assisted industry partners in sample analysis

Undergraduate Research Assistant

2012–2015

Michigan State University | Advised by Prof. Richard Lunt

- Initiated and led a project on near-infrared absorbers for organic photovoltaics which resulted in a licensed patent and three journal publications.
- Discovered that anions can shift frontier energy levels, improving open-circuit voltage of small bandgap OPVs

Teaching Experience

- **Discussion Instructor**, Introduction to Materials Science, University of Minnesota, Fall 2018 (*Outstanding TA Award*)
- **Lead Teaching Assistant**, Materials Properties Lab, University of Minnesota, Spring 2018 (*Outstanding TA Award*)
- **Teaching Assistant**, Thermodynamics of Materials, University of Minnesota, Fall 2016

Publications

- 12 CP Clark, J Mann, **JS Bangsund**, *et al.* Formation and Stability of All-Perovskite Heterojunctions. *In prep.*
- 11 **JS Bangsund**, *et al.* Sub-turn-on Exciton Quenching Due to Molecular Orientation and Polarization in Organic Light-Emitting Devices. *Science Advances*, (2020). *In press*. DOI: [10.1126/sciadv.abb2659](https://doi.org/10.1126/sciadv.abb2659)
- 10 D Rai, **JS Bangsund**, *et al.* Impact of Molecular Structure on Singlet and Triplet Exciton Diffusion in Phenanthroline Derivatives. *Journal of Materials Chemistry C* (2020). DOI: [10.1039/DoTC00716A](https://doi.org/10.1039/DoTC00716A)
- 9 R Newcomb*, **JS Bangsund***, *et al.* Role of Excimer Formation in Degradation of Organic Light-Emitting Devices. *Applied Physics Letters* (2020). DOI: [10.1063/1.5124802](https://doi.org/10.1063/1.5124802). **Editor's Pick**. *Equal contributors
- 8 **JS Bangsund** and Russell J. Holmes. Impacts of Degradation on Annihilation and Efficiency Roll-Off in Organic Light-Emitting Devices. *Proc. of SPIE*. (2019). DOI: [10.1117/12.2528780](https://doi.org/10.1117/12.2528780)
- 7 **JS Bangsund**, *et al.* Spontaneous Formation of Aligned, Periodic Patterns During Crystallization of Organic Semiconductor Thin Films. *Nature Materials* (2019). DOI: [10.1038/s41563-019-0379-3](https://doi.org/10.1038/s41563-019-0379-3)
- 6 **JS Bangsund***, KW Hershey*, *et al.* Improved Stability in Organic Light-Emitting Devices by Mixing Ambipolar and Wide Energy Gap Hosts. *Journal of the Society for Information Display* (2019). DOI: [10.1002/jsid.761](https://doi.org/10.1002/jsid.761). *Equal contributors
- 5 **JS Bangsund**, *et al.* Isolating Degradation Mechanisms in Mixed Emissive Layer Organic Light-Emitting Devices. *ACS Applied Materials and Interfaces* (2018). DOI: [10.1021/acsami.7b16643](https://doi.org/10.1021/acsami.7b16643)
- 4 KW Hershey, **JS Bangsund**, *et al.* Decoupling Degradation in Exciton Formation and Recombination During Lifetime Testing of Organic Light-Emitting Devices. *Applied Physics Letters* (2017). DOI: [10.1063/1.4993618](https://doi.org/10.1063/1.4993618)
- 3 CJ Traverse, M Young, **JS Bangsund**, *et al.* Anions for Near-Infrared Selective Organic Salt Photovoltaics. *Scientific Reports* (2017). DOI: [10.1038/s41598-017-16539-3](https://doi.org/10.1038/s41598-017-16539-3)
- 2 M Young, **JS Bangsund**, *et al.* Organic Heptamethine Salts for Photovoltaics and Detectors with Near-Infrared Photoreponse up to 1600 nm. *Advanced Optical Materials* (2016). DOI: [10.1002/adom.201600102](https://doi.org/10.1002/adom.201600102)
- 1 **JS Bangsund**, *et al.* Organic Salts as a Route to Energy Level Control in Low Bandgap, High Open-Circuit Voltage Organic and Transparent Solar Cells. *Advanced Energy Materials* (2016). DOI: [10.1002/aenm.201501659](https://doi.org/10.1002/aenm.201501659)

Conference Presentations

- 5 Impacts of Degradation on Annihilation and Efficiency Roll-off in Organic Light-Emitting Devices. Oral Presentation. *SPIE Organic Electronics + Photonics*, San Diego, CA. 08/2019.
- 4 Spontaneous Formation of Aligned, Periodic Patterns During Crystallization of Organic Semiconductor Thin Films. Poster Presentation. *Materials Research Society Fall Meeting*, Boston, MA. 11/2018.
- 3 Quantifying Multiple Active Degradation Mechanisms in Mixed Host Organic Light-Emitting Devices. Oral Presentation. *Materials Research Society Spring Meeting*, Phoenix, AZ. 4/2018.
- 2 Understanding Improved Lifetime in Mixed Emissive Layer Organic Light-Emitting Devices. Oral Presentation. *Optical Society of America Solid-State Lighting Meeting*, Boulder, CO. 11/2017.
- 1 Energy Level Control in Organic Salts for Efficient, Deep Near-Infrared Organic and Transparent Photovoltaics. Oral Presentation. *Materials Research Society Spring Meeting*, Phoenix, AZ. 3/2016.

Patents

- RR Lunt, **JS Bangsund**, M Young, and CJ Traverse. *ORGANIC SALTS FOR HIGH VOLTAGE ORGANIC AND TRANSPARENT SOLAR CELLS*. PCT/US2016/026169. April, 2016. *Licensed by Ubiquitous Energy*.
- **JS Bangsund**, RJ Holmes, TR Fielitz. *FORMATION OF ALIGNED PERIODIC PATTERNS DURING THE CRYSTALLIZATION OF ORGANIC SEMICONDUCTOR THIN FILMS*. Provisional Application No. 62/851,709. May, 2019.