

Contact

Email jsb@umn.edu
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Skills

Experimental

OLED design and fabrication
Physical vapor deposition
Electrical characterization
Transient luminescence
Spectroscopy and optics
Arduino and circuit design
Ellipsometry
Atomic force microscopy
Optical microscopy
X-ray diffraction

Programming and Modeling

Python
MATLAB
LabView
Test automation
Optical modeling
Transfer matrix, OLED outcoupling
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 experience in photovoltaics and LEDs. I develop scientific software and hardware for new measurement techniques, modeling, and improved data analysis methods. During my PhD work, I applied these techniques to better understand degradation mechanisms and excited state kinetics in 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–Summer 2020 (expected)

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 DuPont to characterize OLED degradation and explain stability differences between proprietary host materials
- Developed techniques based on optical probes to quantify the pathways of OLED degradation, such as changes in quantum yield and excited state kinetics
- Designed hardware and software for automation of OLED lifetime testing
- 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 grating structures in organic thin films for scattering layers in OLEDs and lasers

Ellipsometry Technician

Oct. 2016–Present

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

- 11 **JS Bangsund**, *et al.* Exciton Quenching Below Turn-on in Organic Light-Emitting Devices Due to Spontaneous Orientation Polarization. *Submitted*.
- 10 D Rai, **JS Bangsund**, *et al.* Influence of Molecular Structure on Singlet and Triplet Exciton Diffusion in Phenanthroline Derivatives. *Submitted*.
- 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 Photore-sponse 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)

Selected Conference Presentations

- 5 **JS Bangsund**, *et al.* Sub-Turn-on Exciton Quenching Modulated by Spontaneous Orientation Polarization in Organic Light-Emitting Devices. Oral Presentation. *APS March Meeting*, Denver, CO. 03/2020.
- 4 **JS Bangsund**, *et al.* 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.
- 3 **JS Bangsund**, *et al.* Spontaneous Formation of Aligned, Periodic Patterns During Crystallization of Organic Semiconductor Thin Films. Poster Presentation. *Materials Research Society Fall Meeting*, Boston, MA. 11/2018.
- 2 **JS Bangsund**, *et al.* Quantifying Multiple Active Degradation Mechanisms in Mixed Host Organic Light-Emitting Devices. Oral Presentation. *Materials Research Society Spring Meeting*, Phoenix, AZ. 4/2018.
- 1 **JS Bangsund**, *et al.* 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*.

Interests

Woodworking, gardening, rock climbing, backpacking, biking, saxophone, jazz, and creative writing