

Dr. Kushal Bagchi, Incoming Assistant Professor, Rice University

kb122@rice.edu, kbagchi@uchicago.edu, kushalbagchi1992@gmail.com ; 608-692-7564.

5640 S Ellis Ave, Chicago, IL 60637

Education

University of Wisconsin-Madison , Madison, WI, USA	06/2020
Ph.D., Chemistry	
Pondicherry University , Kalapet, PY, India	05/2015
Master of Science, Chemistry	
St Joseph's College , Bangalore, KA, India	05/2013
Bachelor of Science, Chemistry and Microbiology	

Research experience

Rice University , Houston, TX, USA	Starting 07/2024
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Norman Hackerman-Welch Assistant Professor of Chemistry

The University of Chicago , Chicago, IL, USA	08/2020-06/2024
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Advisor: **Prof. Paul Nealey**

Postdoctoral scholar (UChicago), Pritzker School of Molecular Engineering

- Used nanolithography to assemble photonic and charge conducting liquid crystals.
- Studied microfluidic flow of chiral liquid crystals.
- Studied conformation of polymer brushes using small molecule reporters.

University of Wisconsin-Madison , Madison, WI, USA	08/2015-06/2020
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Advisor: **Prof. Mark Ediger**

Graduate research assistant, Department of Chemistry

- Used synchrotron X-ray scattering to characterize structure and stability of semiconducting organic glasses.
- Studied buried amorphous interfaces using X-ray scattering and spectroscopic ellipsometry.
- Studied crystal growth from organic, organometallic, and chalcogenide glasses.
- Prepared stable organic glasses using physical vapor deposition (PVD).

Indian Institute of Science , Bangalore, KA, India	05/2013-07/2013
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Advisor: **Dr. Susmita Roy**

Undergraduate researcher, Solid State and Structural Chemistry Unit

- Performed molecular dynamics simulations to study water dynamics at functional interfaces of insulin.

Accepted Journal Publications

10 first author and co-first author papers and 7 co-author papers.

1. **Bagchi, K.**, Emeršič, T., Martínez-González, J. A., de Pablo, J. J., & Nealey, P. F. (2023). Functional soft materials from blue phase liquid crystals. *Science Advances*, 9 (30), eadh9393.
2. **Bagchi, K.**, Emeršič, T., Wang, Z., Chen, W., Kim, M., Eom, C., ... & Nealey, P. F. (2023). Crystalline solid retains memory of anisotropy in precursor liquid crystalline phase. *Journal of Materials Chemistry C*, 11 (34), 11466-11475.
3. Feng, H., Kash, B., Yim, S., **Bagchi, K.**, Craig, G., Chen, W., Rowan, S., & Nealey, P.F. (2023). Wetting behavior of A-block-(B-random-C) copolymers with equal block surface energies on surfaces functionalized with B-random-C copolymers. *Langmuir*, 39 (41), 14688–14698.
4. Emeršič, T*, **Bagchi, K***, Martínez-González, J. A., Li, X., de Pablo, J. J., & Nealey, P. F. (2022). A Generalizable Approach to Direct the Self-Assembly of Functional Blue-Phase Liquid Crystals. *Advanced Functional Materials*, 32 (32), 2202721.*=Contributed Equally.

5. Ferron, T. J., Thelen, J. L., **Bagchi, K.**, Deng, C., Gann, E., de Pablo, J. J., ... & DeLongchamp, D. M. (2022). Characterization of the interfacial orientation and molecular conformation in a glass-forming organic semiconductor. *ACS Applied Materials & Interfaces*, 14 (2), 3455-3466.
6. Fiori, M.E*, **Bagchi, K***, Toney, M.F. and Ediger, M.D. (2021). Surface equilibration mechanism controls the molecular packing of glassy molecular semiconductors at organic interfaces. *Proceedings of the National Academy of Sciences*, 118 (42), e2111988118. *=Contributed Equally.
7. Bishop, C., **Bagchi, K.**, Toney, M. F., & Ediger, M. D. (2022). Vapor deposition rate modifies anisotropic glassy structure of an anthracene-based organic semiconductor. *The Journal of Chemical Physics*, 156 (1), 014504.
8. Barták, J., Málek, J., **Bagchi, K.**, Ediger, M. D., Li, Y., & Yu, L. (2021). Surface mobility in amorphous selenium and comparison with organic molecular glasses. *The Journal of Chemical Physics*, 154(7), 074703.
9. **Bagchi, K.**, Fiori, M. E., Bishop, C., Toney, M. F., & Ediger, M. D. (2020). Stable glasses of organic semiconductor resist crystallization. *The Journal of Physical Chemistry B*, 125 (1), 461-466.
10. **Bagchi, K.**, & Ediger, M. D. (2020). Controlling structure and properties of vapor-deposited glasses of organic semiconductors: Recent advances and challenges. *The Journal of Physical Chemistry Letters*, 11(17), 6935-6945.
11. Thelen, J. L., Bishop, C., **Bagchi, K.**, Sunday, D. F., Gann, E., Mukherjee, S., ... & DeLongchamp, D. M. (2020). Molecular orientation depth profiles in organic glasses using polarized resonant soft X-ray reflectivity. *Chemistry of Materials*, 32 (15), 6295-6309.
12. **Bagchi, K.**, Deng, C., Bishop, C., Li, Y., Jackson, N. E., Yu, L., ... & Ediger, M. D. (2020). Over what length scale does an inorganic substrate perturb the structure of a glassy organic semiconductor?. *ACS Applied Materials & Interfaces*, 12 (23), 26717-26726.
13. **Bagchi, K.**, Gujral, A., Toney, M.F. and Ediger, M.D. (2019). Generic packing motifs in vapor-deposited glasses of organic semiconductors. *Soft Matter*, 15 (38), 7590-7595.
14. **Bagchi, K.**, Jackson, N.E., Gujral, A., Huang, C., Toney, M.F., Yu, L., de Pablo, J.J. and Ediger, M.D. (2018). Origin of anisotropic molecular packing in vapor-deposited Alq3 glasses. *The journal of physical chemistry letters*, 10(2), 164-170.
15. Tangpatjaroen, C., **Bagchi, K.**, Martínez, R.A., Grierson, D. and Szlufarska, I. (2018). Mechanical properties of structure-tunable, vapor-deposited TPD glass. *The Journal of Physical Chemistry C*, 122 (48), 27775-27781.
16. Van den Brande, N., Gujral, A., Huang, C., **Bagchi, K.**, Hofstetter, H., Yu, L. and Ediger, M.D. (2018). Glass structure controls crystal polymorph selection in vapor-deposited films of 4, 4'-Bis (N-carbazolyl)-1, 1'-biphenyl. *Crystal Growth & Design*, 18(10), 5800-5807.
17. **Bagchi, K.**, and Roy, S. (2014). Sensitivity of water dynamics to biologically significant surfaces of monomeric insulin: Role of topology and electrostatic interactions. *The Journal of Physical Chemistry B*, 118(14), 3805-3813.

Manuscripts in preparation

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18. Emersic, T*, **Bagchi, K***, Fitz, S., Nealey, P., & de Pablo, J.J Optical modulation of cholesteric structures using microfluidics. *=contributed equally.
 19. Emersic, T., Zhang, R., Martínez-González, J., **Bagchi, K.**, Nealey, P., & de Pablo, J.J. Flow-induced switching between blue phases.

Awards

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- 04/2019 **K.V. and Sara Reddy Award in Physical Chemistry:** This award is provided by UW-Madison's Department of Chemistry to one graduate student every year for excellence in physical chemistry research. The award is presented to roughly 1 in 50 Physical Chemistry graduate students every year.

Invited Talks

1. Gordon Research Seminar, Soft Condensed Matter Physics, New London, NH, USA, 2023.
2. Raman Research Institute, Division of Soft Matter, Bangalore, KA, India, 2023.
3. Tata Institute of Fundamental Research, Centre for Interdisciplinary Sciences (TCIS), Hyderabad, TG, India, 2023.
4. Tata Institute of Fundamental Research, Department of Chemical Sciences (DCS), Mumbai, MH, India, 2023.
5. Indian Institute of Technology, Department of Materials Science and Engineering, Delhi, India, 2023.
6. Zhejiang University (Virtual), Department of Polymer Science and Engineering, China, 2022.
7. Condensed Matter Division of the European Physical Society International conference in the session "Ultrastable Glasses: New perspectives for an old problem" (Virtual), 2020.
8. K.V. and Sara Reddy Award lecture, Department of Chemistry, UW-Madison, Madison, WI, USA, 2019.

Presentations

1. **Bagchi, K.**, Emersic, T., De Pablo, J., & Nealey, P. Using polymers to direct the self-assembly of complex liquid crystalline phases. *American Physical Society*, Las Vegas, NV, 2023.
2. **Bagchi, K.**, Emersic, T., Wang, Z., Chen, W., De Pablo, J., & Nealey, P. Using discotic liquid crystals to prepare biaxially textured organic semiconductors. *American Physical Society*, Las Vegas, NV, 2023.
3. **Bagchi, K.**, Emeršič, T., De Pablo, J., & Nealey, P. Directed self-assembly and post assembly modification of polymerizable blue-phase single crystals. *American Physical Society*, Chicago, IL, 2022.
4. **Bagchi et al**, Preparing anisotropic glasses by surface templating of supercooled liquids. *Gordon Research Conference, Chemistry and Physics of liquids*, Holderness, NH, 2019.
5. **Bagchi, K.**, Jackson, N., Gujral, A., De Pablo, J. and Ediger, M.,. Origin of Translational and Dipolar Order in Vapor-Deposited Alq₃ glasses. *American Physical Society*, Los Angeles, CA, 2018.
6. **Bagchi et al**. Synchrotron X-ray scattering characterization of vapor-deposited organic semiconductor glasses. *Corning Glass Summit*. Corning, NY, 2018.

Grants

1. Co-authored the grant proposal for the successful renewal of Department of Energy (DOE) Award DE-SC0002161, funding Ph.D. research. PI: Mark Ediger.

Supervised students

1. Marie Fiori- Junior graduate student in Ediger group.
2. Seth Cohen- Undergraduate student in Nealey group.

Teaching experience

Teaching assistant at UW-Madison for:

1. **CHEM 115, Chemical Principles I:** Quantum theory, molecular structure, and chemical bonding.
2. **CHEM 116, Chemical Principles II:** Thermodynamics, chemical equilibria, solution behavior, electrochemistry, and chemical kinetics
3. **CHEM 109, Advanced General Chemistry:** Atomic and molecular structure, chemical equilibrium, acid-base chemistry, thermodynamics, kinetics, and electrochemistry.

Service experience

1. Member of Committee on Equity, Diversity, & Inclusion, Pritzker school of Molecular Engineering (From Dec 2022).
2. Member of Postdoc Association, Pritzker school of Molecular Engineering (From Aug 2023).

3. Member of University of Chicago Postdoc Advisory Board (2022).
4. Nealey group Social Media Manager (2020-2022).
5. Volunteer for Chicago South Side Science Festival (2023).
6. Volunteer for UW-Madison PEOPLE program (2016-2019).
7. Volunteer for Wisconsin Science Festival (2016-2019).
8. Volunteer for UW-Madison's Engineering Expo (2016-2019).
9. Proposal reviewer for beamtime user program of Stanford Synchrotron Radiation Lightsource (SSRL).
10. Review editor for *Frontiers in Soft Matter*.
11. Reviewer for ACS journal *Molecular Pharmaceutics*.

Recommendation writers

- 1) Prof. Mark Ediger, University of Wisconsin-Madison, Email: ediger@chem.wisc.edu
- 2) Prof. Paul Nealey, University of Chicago, Email: nealey@uchicago.edu
- 3) Prof. Paul Voyles, University of Wisconsin-Madison, Email: paul.voyles@wisc.edu
- 4) Prof. Lian Yu, University of Wisconsin-Madison, Email: lian.yu@wisc.edu
- 5) Prof. Michael Toney, University of Colorado Boulder, Email: michael.toney@colorado.edu