

Ayanjeet Ghosh

Department of Chemistry
University of Alabama
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APPOINTMENTS

University of Alabama
Assistant Professor
Department of Chemistry

Tuscaloosa, AL
Aug 2018 – present

University of Illinois, Urbana-Champaign
Postdoctoral Associate
Beckman Institute for Advanced Science and Technology
Research advisor: Prof. Rohit Bhargava

Urbana, IL
Mar 2016 – Aug 2018

Research topics:

- *Investigating cellular changes at the molecular level during cancer using a combination of atomic force microscopy and vibrational spectroscopy*
- *Infrared microscopy of adsorption heterogeneities in metal-organic frameworks*

University of Wisconsin-Madison
Postdoctoral Associate
Department of Chemistry

Madison, WI
Jan 2014 – Mar 2016

Research advisor: Prof. Martin Zanni

Research topics:

- *Investigating protein folding mechanisms on surfaces using two-dimensional sum frequency generation (2DSFG) spectroscopy*
- *Implementation of focal plane arrays for 2DIR spectroscopic detection*
- *Development of widefield 2DIR imaging using optical pulse shaping and focal plane arrays*

University of Pennsylvania
Postdoctoral Associate
Ultrafast Optical Processes Laboratory

Philadelphia, PA
Aug 2012 – Dec 2013

Research advisors: Prof. Robin M. Hochstrasser and Prof. Feng Gai

Research topic:

- *Exploring drug binding mechanisms in transmembrane proteins using two-dimensional infrared spectroscopy*

EDUCATION

University of Pennsylvania
Ph.D. – Physical Chemistry
PhD advisor: Prof. Robin M. Hochstrasser

Philadelphia, PA
2006 – 2012

Title: *Vibrational dynamics in peptides and proteins using two-dimensional infrared spectroscopy*

Indian Institute of Technology M. Sc., Chemistry Thesis advisor: Prof. Debabrata Goswami Title: <i>Exploring optical nonlinearities with femtosecond laser pulses</i>	Kanpur, India 2004 – 2006
Saha Institute of Nuclear Physics Summer Research Fellow Research Advisor: Prof. Dipak Dasgupta	Kolkata, India 2005
B. Sc. (Hons.), Chemistry with Physics and Mathematics University of Calcutta	Kolkata, India 2001 – 2004

AWARDS AND HONORS

- Certificate of Merit, Indian Institute of Technology, Kanpur 2005
- ACS Physical Chemistry Poster Award 2012

TEACHING AND MENTORING

- Teaching Assistant: General Chemistry Laboratory, University of Pennsylvania Fall 2006
- Teaching Assistant: General Chemistry Laboratory, University of Pennsylvania Spring 2007
- Postdoctoral Mentor: Nano REU program, University of Illinois, Urbana-Champaign Summer 2016
- Instructor: CH341, University of Alabama Fall 2018

PUBLICATIONS

Ghosh A, Mukherjee P, Lamborn MJ, Monwar MM, DesLauriers PJ and Bhargava R. Nanoscale *Structural Transition in Polyethylene characterized by AFM-IR spectroscopy*, **In preparation**

Mukherjee P*, **Ghosh A***, Spegazzini N, Lamborn MJ, Monwar MM, DesLauriers PJ and Bhargava R. *Investigating Post Yield Mechanical Properties of Polyethylenes using Infrared Spectroscopic Imaging: Copolymers*, **In preparation**

Mukherjee P*, **Ghosh A***, Spegazzini N, Lamborn MJ, Monwar MM, DesLauriers PJ and Bhargava R. *Relating Post-yield Mechanical Behavior in Polyethylenes to Spatially Varying Molecular Deformation Using Infrared Spectroscopic Imaging: Homopolymers*, **Macromolecules**, 51 (10), 3836–3844, 2018.

DOI: [10.1021/acs.macromol.8b00363](https://doi.org/10.1021/acs.macromol.8b00363)

Ho J, **Ghosh A**, Zhang T and Zanni MT. *Heterogeneous Amyloid β -Sheet Polymorphs Identified on Hydrogen Bond Promoting Surfaces Using 2D SFG Spectroscopy*, **Journal of Physical Chemistry A**, 122 (5), 1270–1282, 2018.

DOI: [10.1021/acs.jpca.7b11934](https://doi.org/10.1021/acs.jpca.7b11934)

Ghosh A*, Mukherjee P*, Deb S and Bhargava R. *Mapping Solvation Environments in Porous Metal Organic Frameworks with Infrared Chemical Imaging*. Accepted. **Journal of Physical Chemistry Letters**, 8 (21), 5325–5330, 2017. DOI: [10.1021/acs.jpcllett.7b02104](https://doi.org/10.1021/acs.jpcllett.7b02104)

Ghosh A, Ostrander JS and Zanni MT. *Watching Proteins Wiggle: Mapping Structures with Two-Dimensional Infrared Spectroscopy*. **Chemical Reviews**, 117 (16), 10726–10759, 2017.

DOI: [10.1021/acs.chemrev.6b00582](https://doi.org/10.1021/acs.chemrev.6b00582)

Ostrander JS, Serrano AL, **Ghosh A** and Zanni MT. *Spatially Resolved Two-Dimensional Infrared Spectroscopy via Wide-Field Microscopy*. **ACS Photonics**, 2016, 3 (7), 1315–1323. DOI: [10.1021/acsphotonics.6b00297](https://doi.org/10.1021/acsphotonics.6b00297)

Ghosh A*, Serrano AL*, Oudenhoven TA, Ostrander JS, Eklund EC, Blair AF, and Zanni MT. *Experimental implementations of 2D IR spectroscopy through a horizontal pulse shaper design and a focal plane array detector*. **Optics Letters**, 41(3), 524-527, 2016. DOI: [10.1364/OL.41.000524](https://doi.org/10.1364/OL.41.000524)

Ho J, Skoff DR, **Ghosh A** and Zanni MT. *Structural Characterization of Single-Stranded DNA Monolayers Using Two-Dimensional Sum Frequency Generation Spectroscopy*. **Journal of Physical Chemistry B**, 119 (33), 10586-10596. DOI: [10.1021/acs.jpcc.5b07078](https://doi.org/10.1021/acs.jpcc.5b07078)

Serrano AL*, **Ghosh A***, Ostrander JS, Zanni MT. *Wide-field FTIR Microscopy using Mid-IR Pulse Shaping*. **Optics Express**, 23(14), 17815-17827, 2015. DOI: [10.1364/OE.23.017815](https://doi.org/10.1364/OE.23.017815)

Ghosh A, Ho J, Serrano AL, Skoff DR, Zhang T and Zanni MT. *Two-dimensional sum-frequency generation (2D SFG) spectroscopy: Summary of principles and its application to amyloid fiber monolayers*. **Faraday Discussions**, 177, 493-505, 2015. DOI: [10.1039/C4FD00173G](https://doi.org/10.1039/C4FD00173G)

Ghosh A, Wang J, Moroz Y, Korendovych I, Zanni M, DeGrado WF, Gai, F and Hochstrasser RM. *2D IR spectroscopy reveals the role of water in the binding of channel-blocking drugs to the influenza M2 channel*. **Journal of Chemical Physics**, 140, 235105, 2014. DOI: [10.1063/1.4881188](https://doi.org/10.1063/1.4881188)

Pazos IM, **Ghosh A**, Tucker MJ, Gai, F. *Ester Carbonyl Vibration as a Sensitive Probe of Protein Local Electric Field*. **Angewandte Chemie International Edition**, 126, 6194–6198, 2014. DOI: [10.1002/ange.201402011](https://doi.org/10.1002/ange.201402011)

Ghosh A, Tucker MJ, Gai, F. *2D IR Spectroscopy of Histidine: Probing Sidechain Structure and Dynamics via Backbone Amide I Vibration*. **Journal of Physical Chemistry B**, 118 (28), 7799–7805, 2014. DOI: [10.1021/jp411901m](https://doi.org/10.1021/jp411901m)

Chuntonov L, Kuroda DG, **Ghosh A**, Ma JQ, Hochstrasser RM. *Quantum Beats and Coherence Decay in Degenerate States Split by Solvation*. **Journal of Physical Chemistry Letters**, 4 (11), 1866-1871, 2013. DOI: [10.1021/jz400826a](https://doi.org/10.1021/jz400826a)

Lahiri S, Takao T, Devi PG, Ghosh S, **Ghosh A**, Dasgupta A, Dasgupta, D. *Association of aureolic acid antibiotic, chromomycin A3 with Cu²⁺ and its negative effect upon DNA binding property of the antibiotic*. **Biometals**, 25(2), 435-450, 2012. DOI: [10.1007/s10534-011-9516-4](https://doi.org/10.1007/s10534-011-9516-4)

Ghosh A, Hochstrasser RM. *A peptide's perspective of water dynamics*. **Chemical Physics**, 390(1), 1-13, 2011. DOI: [10.1016/j.chemphys.2011.07.018](https://doi.org/10.1016/j.chemphys.2011.07.018)

Cover Article and Featured as Editor's Choice

Ghosh A, Tucker MJ, Hochstrasser RM. *Identification of Arginine Residues in Peptides by 2D-IR Echo Spectroscopy*. **Journal of Physical Chemistry A**, 115(34), 9731-8, 2011. DOI: [10.1021/jp201794n](https://doi.org/10.1021/jp201794n)

Ghosh A, Qiu J, DeGrado WF, Hochstrasser RM. *Tidal surge in the M2 proton channel, sensed by 2D IR spectroscopy*. **Proceedings of the National Academy of Sciences of the United States of America**, 108(15), 6115-20, 2011. DOI: [10.1073/pnas.1103027108](https://doi.org/10.1073/pnas.1103027108)

Ghosh A, Remorino A, Tucker MJ, Hochstrasser RM. *2D IR photon echo spectroscopy reveals hydrogen bond dynamics of aromatic nitriles*. **Chemical Physics Letters**, 469(4-6), 325-30, 2009. DOI: [10.1016/j.cplett.2008.12.094](https://doi.org/10.1016/j.cplett.2008.12.094)

* **Equal Contribution**

RESEARCH PRESENTATIONS

Poster Presentations

Ayanjeet Ghosh, Jade Qiu, William F. DeGrado, Robin M. Hochstrasser "*Confined Water Dynamics In The M2 channel By 2D IR Spectroscopy*" Gordon Research Conference - Vibrational Spectroscopy, University of New England, Biddeford, ME, August 2010.

Ayanjeet Ghosh, Yurii S. Moroz, Jun Wang, Ivan M. Korendovych, William F. Degrado, and Robin M. Hochstrasser "*2D IR spectroscopy exposes drug binding through water dynamics in the M2 proton channel*" Gordon Research Conference - Water & Aqueous Solutions, Holderness School, Holderness, NH, August 2012.

Ayanjeet Ghosh, Yurii S. Moroz, Jun Wang, Ivan M. Korendovych, William F. Degrado, and Robin M. Hochstrasser "*Spectral densities of amide modes probe effects of drug binding on water in the M2 channel*" American Chemical Society Fall 2012 Symposium, Philadelphia, PA, August 2012. **(Winner of the ACS Physical Chemistry Poster Award)**

Ayanjeet Ghosh, Yurii S. Moroz, Jun Wang, Ivan M. Korendovych, William F. Degrado, and Robin M. Hochstrasser "*Residue specific hydration and drug-water interactions in the M2 channel revealed by 2D IR spectroscopy*" Biophysical Society Meeting, Philadelphia, PA, January 2013.

Ayanjeet Ghosh, Arnaldo L. Serrano and Martin T. Zanni "*Signal enhancement in 2D IR experiments through reference detection using a focal plane array detector*" TRVS, Madison, WI, June 2015

Ayanjeet Ghosh, Jia-Jung Ho and Martin T. Zanni "*Investigating aggregation of amyloid peptides on self-assembled monolayers using two dimensional sum frequency generation spectroscopy*" TRVS, Madison, WI, June 2015

Oral Presentations

Ayanjeet Ghosh "*Vibrational Dynamics in peptides and proteins using two-dimensional infrared and sum-frequency generation spectroscopies*" S.N. Bose National Centre for Basic Sciences, Kolkata, India, August 2015 **(Invited Talk)**

Ayanjeet Ghosh, Jia-Jung Ho and Martin T. Zanni "*2D SFG provides molecular insights into aggregation of amyloid peptides on self-assembled monolayers*" Pacificchem, Honolulu, HI, December 2015