



Michael Fayer

David Mulvane Ehram and Edward Curtis Franklin Professor of Chemistry

 Curriculum Vitae available Online

CONTACT INFORMATION

• Administrative Contact

Teresa Throckmorton - Administrative Associate

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Bio

BIO

My research group studies complex molecular systems by using ultrafast multi-dimensional infrared and non-linear UV/Vis methods. A basic theme is to understand the role of mesoscopic structure on the properties of molecular systems. Many systems have structure on length scales large compared to molecules but small compared to macroscopic dimensions. The mesoscopic structures occur on distance scales of a few nanometers to a few tens of nanometers. The properties of systems, such as water in nanoscopic environments, room temperature ionic liquids, functionalized surfaces, liquid crystals, metal organic frameworks, water and other liquids in nanoporous silica, polyelectrolyte fuel cell membranes, vesicles, and micelles depend on molecular level dynamics and intermolecular interactions. Our ultrafast measurements provide direct observables for understanding the relationships among dynamics, structure, and intermolecular interactions.

Bulk properties are frequently a very poor guide to understanding the molecular level details that determine the nature of a chemical process and its dynamics. Because molecules are small, molecular motions are inherently very fast. Recent advances in methodology developed in our labs make it possible for us to observe important processes as they occur. These measurements act like stop-action photography. To focus on a particular aspect of a time evolving system, we employ sequences of ultrashort pulses of light as the basis for non-linear methods such as ultrafast infrared two dimensional vibrational echoes, optical Kerr effect methods, and ultrafast IR transient absorption experiments.

We are using ultrafast 2D IR vibrational echo spectroscopy and other multi-dimensional IR methods, which we have pioneered, to study dynamics of molecular complexes, water confined on nm length scales with a variety of topographies, molecules bound to surfaces, ionic liquids, and materials such as metal organic frameworks and porous silica. We can probe the dynamic structures these systems. The methods are somewhat akin to multidimensional NMR, but they probe molecular structural evolution in real time on the relevant fast time scales, eight to ten orders of magnitude faster than NMR. We are obtaining direct information on how nanoscopic confinement of water changes its properties, a topic of great importance in chemistry, biology, geology, and materials. For the first time, we are observing the motions of molecular bound to surfaces. In biological membranes, we are using the vibrational echo methods to study dynamics and the relationship among dynamics, structure, and function. We are also developing and applying theory to these problems frequently in collaboration with top theoreticians.

We are studying dynamics in complex liquids, in particular room temperature ionic liquids, liquid crystals, supercooled liquids, as well as in influence of small quantities of water on liquid dynamics. Using ultrafast optical heterodyne detected optical Kerr effect methods, we can follow processes from tens of femtoseconds to ten microseconds. Our ability to look over such a wide range of time scales is unprecedented. The change in molecular dynamics when a system undergoes a phase change is of fundamental and practical importance. We are developing detailed theory as the companion to the experiments.

We are studying photo-induced proton transfer in nanoscopic water environments such as polyelectrolyte fuel cell membranes, using ultrafast UV/Vis fluorescence and multidimensional IR measurements to understand the proton transfer and other processes and how they are influenced by nanoscopic confinement. We want to understand the role of the solvent and the systems topology on proton transfer dynamics.

ACADEMIC APPOINTMENTS

- Professor, Chemistry
- Member, Bio-X

ADMINISTRATIVE APPOINTMENTS

- David Mulvane Ehram and Edward Curtis Franklin Professor of Chemistry, Stanford University, (2000- present)
- Professor of Chemistry, Stanford University, (1984-2000)
- Associate Professor of Chemistry, Stanford University, (1980-1984)
- Assistant Professor of Chemistry, Stanford University, (1974-1980)
- Professor of Physics, University of Grenoble, (1982-1982)

HONORS AND AWARDS

- Peter Debye Award in Physical Chemistry, American Chemical Society (2021)
- Pittsburgh Spectroscopy Award, Spectroscopy Society of Pittsburgh (2018)
- Ahmed Zewail Award in Ultrafast Science and Technology, American Chemical Society (2014)
- Arthur L. Schawlow Prize in Laser Science, American Physical Society (2012)
- Ellis R. Lippincott Award, Optical Society of America (2009)
- Fellow, Optical Society of America (2009)
- Fellow, Royal Society of Chemistry (2008)
- E. Bright Wilson Award for Spectroscopy, American Chemical Society (2007)
- Member, National Academy of Sciences (2007)
- Earl K. Plyler Prize for Molecular Spectroscopy, American Physical Society (2000)
- Member, American Academy of Arts and Sciences (1999)
- Dean's Award for Distinguished Teaching, Stanford University (1986)
- Fellow, Guggenheim Foundation (1983)
- Fellow, American Physical Society (1982)
- Dreyfus Teacher-Scholar Award, Camille & Henry Dreyfus Foundation (1977)
- Fellow, Camille & Henry Dreyfus Foundation (1977)
- Fellow, Alfred P. Sloan Foundation (1977)
- Phi Beta Kappa, University of California at Berkeley (1969)
- Fellow, National Science Foundation (1966-1967)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Member, Editorial Board, Journal of Chemical Physics (1987 - 1990)
- Member, Advisory Board, Journal of Physical Chemistry (1986 - 1989)
- Associate Editor, Journal of Luminescence (1988 - present)
- Advisory Editor, Chemical Physics (1985 - present)
- Advisory Editor, Chemical Physics Letters (1984 - 2006)
- Chairman, Awards Committee, Earl K. Plyler Prize for Molecular Spectroscopy (2006 - 2006)
- Chairman, 7th International Conference on Unconventional Photoactive Systems, Stanford University (1995 - 1995)
- Chairman, Fourth International Conference on Dynamical Processes, Stanford University (1983 - 1983)
- Member, American Chemical Society
- Member, American Optical Society
- Member, American Physical Society
- Member, Royal Society of Chemistry
- Member, Sigma Xi

PROFESSIONAL EDUCATION

- Ph.D., University of California at Berkeley , Chemistry (1974)
- B.S., University of California at Berkeley , Chemistry (1969)

LINKS

- Lab Website: <https://web.stanford.edu/group/fayer/>

Teaching

COURSES

2021-22

- Advanced Physical Chemistry: CHEM 271 (Aut)
- Spectroscopy Laboratory: CHEM 176 (Win)

2020-21

- Advanced Physical Chemistry: CHEM 271 (Aut)
- Spectroscopy Laboratory: CHEM 176 (Win)

2019-20

- Advanced Physical Chemistry: CHEM 271 (Aut)
- Spectroscopy Laboratory: CHEM 176 (Win)

2018-19

- Advanced Physical Chemistry: CHEM 271 (Aut)
- Spectroscopy Laboratory: CHEM 176 (Win)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Jeffrey Babicz, Dashiell Grusky, Jiachen Li, Annina Sartor, Chu Zheng, Haowen Zhou

Postdoctoral Faculty Sponsor

Kimberly Carter Fenk

Doctoral Dissertation Advisor (AC)

John Breen, Aaron Charnay, Sebastian Fica Contreras, Tristan Heck, Sam Hung, Junkun Pan, Sean Roget, Jordyn Smith, Stephen Van Wyck, Xiangyu Xing

Publications

PUBLICATIONS

- **Structural Influences on the Fast Dynamics of Alkylsiloxane Monolayers on SiO₂ Surfaces Measured with 2D IR Spectroscopy** *JOURNAL OF PHYSICAL CHEMISTRY C*
Yan, C., Yuan, R., Nishida, J., Fayer, M. D.
2015; 119 (29): 16811-16823
- **The Influence of Cholesterol on Fast Dynamics Inside of Vesicle and Planar Phospholipid Bilayers Measured with 2D IR Spectroscopy** *JOURNAL OF PHYSICAL CHEMISTRY B*
Kel, O., Tamimi, A., Fayer, M. D.
2015; 119 (29): 8852-8862
- **Dynamics of water, methanol, and ethanol in a room temperature ionic liquid.** *journal of chemical physics*
Kramer, P. L., Giammanco, C. H., Fayer, M. D.
2015; 142 (21): 212408-?
- **Proton Transfer in Ionic and Neutral Reverse Micelles** *JOURNAL OF PHYSICAL CHEMISTRY B*
Lawler, C., Fayer, M. D.
2015; 119 (19): 6024-6034
- **Structural dynamics inside a functionalized metal-organic framework probed by ultrafast 2D IR spectroscopy.** *Proceedings of the National Academy of Sciences of the United States of America*
Nishida, J., Tamimi, A., Fei, H., Pullen, S., Ott, S., Cohen, S. M., Fayer, M. D.
2014; 111 (52): 18442-18447
- **New divergent dynamics in the isotropic to nematic phase transition of liquid crystals measured with 2D IR vibrational echo spectroscopy** *JOURNAL OF CHEMICAL PHYSICS*
Sokolowsky, K. P., Bailey, H. E., Fayer, M. D.
2014; 141 (19)
- **Orientational Dynamics in a Lyotropic Room Temperature Ionic Liquid** *JOURNAL OF PHYSICAL CHEMISTRY B*
Sturlaugson, A. L., Arima, A. Y., Bailey, H. E., Fayer, M. D.
2013; 117 (47): 14775-14784
- **Dynamics of isolated water molecules in a sea of ions in a room temperature ionic liquid.** *journal of physical chemistry. B*
Wong, D. B., Giammanco, C. H., Fenn, E. E., Fayer, M. D.
2013; 117 (2): 623-635
- **Protein Dynamics Studied with Ultrafast Two-Dimensional Infrared Vibrational Echo Spectroscopy** *ACCOUNTS OF CHEMICAL RESEARCH*
Thielges, M. C., Fayer, M. D.
2012; 45 (11): 1866-1874
- **Analysis of Water in Confined Geometries and at Interfaces** *ANNUAL REVIEW OF ANALYTICAL CHEMISTRY, VOL 3*
Fayer, M. D., Levinger, N. E.
2010; 3: 89-107
- **Ultrafast dynamics of solute-solvent complexation observed at thermal equilibrium in real time** *SCIENCE*
Zheng, J. R., Kwak, K., Asbury, J., Chen, X., Piletic, I. R., Fayer, M. D.
2005; 309 (5739): 1338-1343
- **Identical Water Dynamics in Acrylamide Hydrogels, Polymers, and Monomers in Solution: Ultrafast IR Spectroscopy and Molecular Dynamics Simulations.** *Journal of the American Chemical Society*

- Roget, S. A., Piskulich, Z. A., Thompson, W. H., Fayer, M. D.
2021
- **Ultrafast Dynamics and Liquid Structure in Mesoporous Silica: Propagation of Surface Effects in a Polar Aprotic Solvent.** *The journal of physical chemistry. B*
Hung, S. T., Yamada, S. A., Zheng, W., Fayer, M. D.
2021
 - **Long Vibrational Lifetime R-Selenocyanate Probes for Ultrafast Infrared Spectroscopy: Properties and Synthesis.** *The journal of physical chemistry. B*
Fica-Contreras, S. M., Daniels, R., Yassin, O., Hoffman, D. J., Pan, J., Sotzing, G., Fayer, M. D.
2021
 - **Distinguishing steric and electrostatic molecular probe orientational ordering via their effects on reorientation-induced spectral diffusion.** *The Journal of chemical physics*
Hoffman, D. J., Fica-Contreras, S. M., Pan, J., Fayer, M. D.
2021; 154 (24): 244104
 - **Complex Formation and Dissociation Dynamics on Amorphous Silica Surfaces.** *The journal of physical chemistry. B*
Yamada, S. A., Hung, S. T., Shin, J. Y., Fayer, M. D.
2021
 - **Orientational Pair Correlations and Local Structure of Benzonitrile from Molecular Dynamics Simulations with Comparisons to Experiments.** *The journal of physical chemistry. B*
Sha, M., Yamada, S. A., Fayer, M. D.
2021
 - **Free Volume Element Sizes and Dynamics in Polystyrene and Poly(methyl methacrylate) Measured with Ultrafast Infrared Spectroscopy.** *Journal of the American Chemical Society*
Fica-Contreras, S. M., Hoffman, D. J., Pan, J., Liang, C., Fayer, M. D.
2021
 - **Pulse-shaped chopping: Eliminating and characterizing heat effects in ultrafast infrared spectroscopy.** *The Journal of chemical physics*
Hoffman, D. J., Fica-Contreras, S. M., Pan, J., Fayer, M. D.
2020; 153 (20): 204201
 - **Proton Transfer Dynamics in the Aprotic Proton Accepting Solvent 1-Methylimidazole.** *The journal of physical chemistry. B*
Thomaz, J. E., Walker, A. R., Van Wyck, S. J., Meisner, J., Martinez, T. J., Fayer, M. D.
2020
 - **Amorphous polymer dynamics and free volume element size distributions from ultrafast IR spectroscopy.** *Proceedings of the National Academy of Sciences of the United States of America*
Hoffman, D. J., Fica-Contreras, S. M., Fayer, M. D.
2020
 - **Effects of pore size on water dynamics in mesoporous silica.** *The Journal of chemical physics*
Yamada, S. A., Hung, S. T., Thompson, W. H., Fayer, M. D.
2020; 152 (15): 154704
 - **Microstructural and Dynamical Heterogeneities in Ionic Liquids.** *Chemical reviews*
Wang, Y., Li, B., Sarman, S., Mocci, F., Lu, Z., Yuan, J., Laaksonen, A., Fayer, M. D.
2020
 - **Enhanced Menshutkin SN2 Reactivity in Mesoporous Silica: The Influence of Surface Catalysis and Confinement.** *Journal of the American Chemical Society*
Zheng, W., Yamada, S. A., Hung, S. T., Sun, W., Zhao, L., Fayer, M. D.
2020
 - **Structural Dynamics in Ionic Liquid Thin Films: The Effect of Cation Chain Length** *JOURNAL OF PHYSICAL CHEMISTRY C*
Wu, B., Breen, J. P., Fayer, M. D.
2020; 124 (7): 4179–89

- **CLS Next Gen: Accurate Frequency-Frequency Correlation Functions from Center Line Slope Analysis of 2D Correlation Spectra Using Artificial Neural Networks.** *The journal of physical chemistry. A*
Hoffman, D. J., Fayer, M. D.
2020
- **Single Ensemble Non-exponential Photoluminescent Population Decays from a Broadband White-Light-Emitting Perovskite.** *Journal of the American Chemical Society*
Thomaz, J. E., Lindquist, K. P., Karunadasa, H. I., Fayer, M. D.
2020
- **Controlling the Dynamics of Ionic Liquid Thin Films via Multilayer Surface Functionalization.** *Journal of the American Chemical Society*
Wu, B. n., Breen, J. P., Xing, X. n., Fayer, M. D.
2020
- **Dynamical properties of a room temperature ionic liquid: Using molecular dynamics simulations to implement a dynamic ion cage model.** *The Journal of chemical physics*
Sha, M., Ma, X., Li, N., Luo, F., Zhu, G., Fayer, M. D.
2019; 151 (15): 154502
- **Direct observation of proton hopping in water/HCl solutions by 2D IR spectroscopy and ab initio simulations**
Fayer, M., Yuan, R., Napoli, J., Markland, T.
AMER CHEMICAL SOC.2019
- **Dynamics of organic molecule-ion and water-ion complexes in concentrated aqueous salt solutions: 2D IR chemical exchange spectroscopy**
Fayer, M.
AMER CHEMICAL SOC.2019
- **Tracking Aqueous Proton Transfer by Two-Dimensional Infrared Spectroscopy and ab Initio Molecular Dynamics Simulations** *ACS CENTRAL SCIENCE*
Yuan, R., Napoli, J. A., Yan, C., Marsalek, O., Markland, T. E., Fayer, M. D.
2019; 5 (7): 1269–77
- **Tracking Aqueous Proton Transfer by Two-Dimensional Infrared Spectroscopy and ab Initio Molecular Dynamics Simulations.** *ACS central science*
Yuan, R., Napoli, J. A., Yan, C., Marsalek, O., Markland, T. E., Fayer, M. D.
2019; 5 (7): 1269-1277
- **Reorientation-induced Stokes shifts caused by directional interactions in electronic spectroscopy: Fast dynamics of poly(methyl methacrylate).** *The Journal of chemical physics*
Thomaz, J. E., Kramer, P. L., Fica-Contreras, S. M., Hoffman, D. J., Fayer, M. D.
2019; 150 (19): 194201
- **Direct determination of proton transfer rate by 2D IR chemical exchange spectroscopy and ab initio molecular dynamics simulation**
Yuan, R., Yan, C., Fayer, M.
AMER CHEMICAL SOC.2019
- **Fast dynamics of a hydrogen-bonding glass forming liquid: Chemical exchange-induced spectral diffusion in 2D IR spectroscopy.** *The Journal of chemical physics*
Hoffman, D. J., Fica-Contreras, S. M., Fayer, M. D.
2019; 150 (12): 124507
- **Fast dynamics of a hydrogen-bonding glass forming liquid: Chemical exchange-induced spectral diffusion in 2D IR spectroscopy** *JOURNAL OF CHEMICAL PHYSICS*
Hoffman, D. J., Fica-Contreras, S. M., Fayer, M. D.
2019; 150 (12)
- **Water Dynamics in Nanoporous Silica: Ultrafast Vibrational Spectroscopy and Molecular Dynamics Simulations** *JOURNAL OF PHYSICAL CHEMISTRY C*
Yamada, S. A., Shin, J., Thompson, W. H., Fayer, M. D.
2019; 123 (9): 5790–5803
- **Imidazole and 1-Methylimidazole Hydrogen Bonding and Nonhydrogen Bonding Liquid Dynamics: Ultrafast IR Experiments** *JOURNAL OF PHYSICAL CHEMISTRY B*
Shin, J., Wang, Y., Yamada, S. A., Hung, S. T., Fayer, M. D.

2019; 123 (9): 2094–2105

- **Imidazole and 1-Methylimidazole Hydrogen Bonding and Nonhydrogen Bonding Liquid Dynamics: Ultrafast IR Experiments.** *The journal of physical chemistry. B*
Shin, J. Y., Wang, Y., Yamada, S. A., Hung, S. T., Fayer, M. D.
2019
- **Dynamics of Water Molecules and Ions in Concentrated Lithium Chloride Solutions Probed with Ultrafast 2D IR Spectroscopy.** *The journal of physical chemistry. B*
Yuan, R. n., Fayer, M. D.
2019
- **Bulk-like and Interfacial Water Dynamics in Nafion Fuel Cell Membranes Investigated with Ultrafast Nonlinear IR Spectroscopy.** *The journal of physical chemistry. B*
Roget, S. A., Kramer, P. L., Thomaz, J. E., Fayer, M. D.
2019
- **Orientalional Pair Correlations in a Dipolar Molecular Liquid: Time-Resolved Resonant and Nonresonant Pump-Probe Spectroscopies** *JOURNAL OF PHYSICAL CHEMISTRY B*
Yamada, S. A., Bailey, H. E., Fayer, M. D.
2018; 122 (50): 12147-12153
- **Orientalional Pair Correlations in a Dipolar Molecular Liquid: Time-Resolved Resonant and Nonresonant Pump-Probe Spectroscopies.** *The journal of physical chemistry. B*
Yamada, S. A., Bailey, H. E., Fayer, M. D.
2018
- **Ion-Molecule Complex Dissociation and Formation Dynamics in LiCl Aqueous Solutions from 2D IR Spectroscopy** *JOURNAL OF PHYSICAL CHEMISTRY B*
Yuan, R., Yan, C., Fayer, M.
2018; 122 (46): 10582-10592
- **Ion-Molecule Complex Dissociation and Formation Dynamics in LiCl Aqueous Solutions from 2D IR Spectroscopy.** *The journal of physical chemistry. B*
Yuan, R., Yan, C., Fayer, M.
2018
- **Dynamics and Microstructures of Nicotine/Water Binary Mixtures near the Lower Critical Solution Temperature** *JOURNAL OF PHYSICAL CHEMISTRY B*
Bailey, H. E., Wang, Y., Lynch, S. R., Fayer, M. D.
2018; 122 (41): 9538–48
- **Dynamics and Microstructures of Nicotine/Water Binary Mixtures near the Lower Critical Solution Temperature.** *The journal of physical chemistry. B*
Bailey, H. E., Wang, Y., Lynch, S. R., Fayer, M. D.
2018
- **Extraordinary Slowing of Structural Dynamics in Thin Films of a Room Temperature Ionic Liquid.** *ACS central science*
Nishida, J., Breen, J. P., Wu, B., Fayer, M. D.
2018; 4 (8): 1065–73
- **Extraordinary Slowing of Structural Dynamics in Thin Films of a Room Temperature Ionic Liquid** *ACS CENTRAL SCIENCE*
Nishida, J., Breen, J. P., Wu, B., Fayer, M. D.
2018; 4 (8): 1065-1073
- **Dynamically Disordered Lattice in a Layered Pb-I-SCN Perovskite Thin Film Probed by Two-Dimensional Infrared Spectroscopy** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
Nishida, J., Breen, J. P., Lindquist, K. P., Umeyama, D., Karunadasa, H. I., Fayer, M. D.
2018; 140 (31): 9882-9890
- **Water Dynamics in Polyacrylamide Hydrogels** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
Yan, C., Kramer, P. L., Yuan, R., Fayer, M. D.
2018; 140 (30): 9466-9477

- **Dynamically Disordered Lattice in a Layered Pb-I-SCN Perovskite Thin Film Probed by Two-Dimensional Infrared Spectroscopy.** *Journal of the American Chemical Society*
Nishida, J., Breen, J. P., Lindquist, K. P., Umeyama, D., Karunadasa, H. I., Fayer, M. D.
2018
- **The influence of hydrophilicity on the orientational dynamics and structures of imidazolium-based ionic liquid/water binary mixtures.** *The Journal of chemical physics*
Bailey, H. E., Wang, Y., Fayer, M. D.
2018; 149 (4): 044501
- **The influence of hydrophilicity on the orientational dynamics and structures of imidazolium-based ionic liquid/water binary mixtures** *JOURNAL OF CHEMICAL PHYSICS*
Bailey, H. E., Wang, Y., Fayer, M. D.
2018; 149 (4)
- **Water Dynamics in Polyacrylamide Hydrogels.** *Journal of the American Chemical Society*
Yan, C., Kramer, P. L., Yuan, R., Fayer, M. D.
2018
- **Preface: Special Topic on Chemical Physics of Ionic Liquids** *JOURNAL OF CHEMICAL PHYSICS*
Perkin, S., Kirchner, B., Fayer, M. D.
2018; 148 (19)
- **Preface: Special Topic on Chemical Physics of Ionic Liquids.** *The Journal of chemical physics*
Perkin, S., Kirchner, B., Fayer, M. D.
2018; 148 (19): 193501
- **Influence of mesoscopic confinement on the dynamics of room temperature ionic liquids**
Fayer, M.
AMER CHEMICAL SOC.2018
- **Monolayer dynamics at the air/ water interface: From ultrafast to ultraslow dynamics**
Fayer, M.
AMER CHEMICAL SOC.2018
- **Influence of Water on Carbon Dioxide and Room Temperature Ionic Liquid Dynamics: Supported Ionic Liquid Membrane vs the Bulk Liquid** *JOURNAL OF PHYSICAL CHEMISTRY B*
Shin, J., Yamada, S. A., Fayer, M. D.
2018; 122 (8): 2389–95
- **Ultrafast to Ultraslow Dynamics of a Langmuir Monolayer at the Air/Water Interface Observed with Reflection Enhanced 2D IR Spectroscopy** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
Yan, C., Thomaz, J. E., Wang, Y., Nishida, J., Yuan, R., Breen, J. P., Fayer, M. D.
2017; 139 (46): 16518–27
- **The influence of mesoscopic confinement on the dynamics of imidazolium-based room temperature ionic liquids in polyether sulfone membranes** *JOURNAL OF CHEMICAL PHYSICS*
Thomaz, J. E., Bailey, H. E., Fayer, M. D.
2017; 147 (19): 194502
- **Discontinuity in Fast Dynamics at the Glass Transition of ortho-Terphenyl** *JOURNAL OF PHYSICAL CHEMISTRY B*
Hoffman, D. J., Fayer, M. D.
2017; 121 (45): 10417–28
- **Guest Hydrogen Bond Dynamics and Interactions in the Metal-Organic Framework MIL-53(AI) Measured with Ultrafast Infrared Spectroscopy** *JOURNAL OF PHYSICAL CHEMISTRY C*
Nishida, J., Fayer, M. D.
2017; 121 (21): 11880-11890
- **Proton Transfer in Perfluorosulfonic Acid Fuel Cell Membranes with Differing Pendant Chains and Equivalent Weights** *JOURNAL OF PHYSICAL CHEMISTRY B*

- Thomaz, J. E., Lawler, C. M., Fayer, M. D.
2017; 121 (17): 4544-4553
- **Dynamics in a Water Interfacial Boundary Layer Investigated with IR Polarization-Selective Pump-Probe Experiments** *JOURNAL OF PHYSICAL CHEMISTRY B*
Yuan, R., Yan, C., Nishida, J., Fayer, M. D.
2017; 121 (17): 4530-4537
 - **Molecular origins of superacidity in sulfated MOF-808**
Trickett, C., Yan, C., Popp, T., Jiang, J., Huq, A., Reimer, J., Fayer, M., Yaghi, O.
AMER CHEMICAL SOC.2017
 - **Dynamics of room temperature ionic liquids measured with two dimensional infrared spectroscopy: The influence of electric fields on observables**
Fayer, M.
AMER CHEMICAL SOC.2017
 - **Carbon dioxide dynamics in room temperature ionic liquids and supported ionic liquid membranes: 2D IR and polarization selective pump-probe experiments**
Fayer, M.
AMER CHEMICAL SOC.2017
 - **Dynamics of functionalized alkyl monolayers on gold: Two dimensional infrared experiments and molecular dynamics simulations**
Fayer, M.
AMER CHEMICAL SOC.2017
 - **Direct observation of dynamic crossover in fragile molecular glass formers with 2D IR vibrational echo spectroscopy** *JOURNAL OF CHEMICAL PHYSICS*
Hoffman, D. J., Sokolowsky, K. P., Fayer, M. D.
2017; 146 (12)
 - **Enhanced nonlinear spectroscopy for monolayers and thin films in near-Brewster's angle reflection pump-probe geometry** *JOURNAL OF CHEMICAL PHYSICS*
Nishida, J., Yan, C., Fayer, M. D.
2017; 146 (9)
 - **Dynamics in a Room-Temperature Ionic Liquid from the Cation Perspective: 2D IR Vibrational Echo Spectroscopy.** *Journal of the American Chemical Society*
Yamada, S. A., Bailey, H. E., Tamimi, A., Li, C., Fayer, M. D.
2017; 139 (6): 2408-2420
 - **Dynamics of a Room Temperature Ionic Liquid in Supported Ionic Liquid Membranes vs the Bulk Liquid: 2D IR and Polarized IR Pump-Probe Experiments** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
Shin, J. Y., Yamada, S. A., Fayer, M. D.
2017; 139 (1): 311-323
 - **Carbon Dioxide in a Supported Ionic Liquid Membrane: Structural and Rotational Dynamics Measured with 2D IR and Pump-Probe Experiments.** *Journal of the American Chemical Society*
Shin, J. Y., Yamada, S. A., Fayer, M. D.
2017
 - **Impact of Hydrogen Bonding on the Dynamics and Structure of Protic Ionic Liquid/Water Binary Mixtures.** *The journal of physical chemistry. B*
Bailey, H. E., Wang, Y. L., Fayer, M. D.
2017; 121 (36): 8564-76
 - **Hydrogen Bonding versus #-# Stacking Interactions in Imidazolium-Oxalatorborate Ionic Liquid.** *The journal of physical chemistry. B*
Wang, Y. L., Laaksonen, A. n., Fayer, M. D.
2017; 121 (29): 7173-79
 - **Water-anion hydrogen bonding dynamics: Ultrafast IR experiments and simulations.** *The Journal of chemical physics*
Yamada, S. A., Thompson, W. H., Fayer, M. D.
2017; 146 (23): 234501

- **Water Dynamics in 1-Alkyl-3-methylimidazolium Tetrafluoroborate Ionic Liquids** *JOURNAL OF PHYSICAL CHEMISTRY B*
Giammanco, C. H., Kramer, P. L., Wong, D. B., Fayer, M. D.
2016; 120 (44): 11523-11538
- **Orientalional Dynamics of a Functionalized Alkyl Planar Monolayer Probed by Polarization-Selective Angle-Resolved Infrared Pump-Probe Spectroscopy.** *Journal of the American Chemical Society*
Nishida, J., Yan, C., Fayer, M. D.
2016: -?
- **The Influence of Water on the Alkyl Region Structure in Variable Chain Length Imidazolium-Based Ionic Liquid/Water Mixtures** *JOURNAL OF PHYSICAL CHEMISTRY B*
Thomaz, J. E., Lawler, C. M., Fayer, M. D.
2016; 120 (39): 10350-10357
- **Ionic Liquid versus Li⁺ Aqueous Solutions: Water Dynamics near Bistriflimide Anions** *JOURNAL OF PHYSICAL CHEMISTRY B*
Giammanco, C. H., Kramer, P. L., Fayer, M. D.
2016; 120 (37): 9997-10009
- **Alkyl Chain Length Dependence of the Dynamics and Structure in the Ionic Regions of Room-Temperature Ionic Liquids.** *journal of physical chemistry. B*
Tamimi, A., Bailey, H. E., Fayer, M. D.
2016; 120 (30): 7488-7501
- **Water of Hydration Dynamics in Minerals Gypsum and Bassanite: Ultrafast 2D IR Spectroscopy of Rocks.** *Journal of the American Chemical Society*
Yan, C., Nishida, J., Yuan, R., Fayer, M. D.
2016; 138 (30): 9694-9703
- **Critical Slowing of Density Fluctuations Approaching the Isotropic-Nematic Transition in Liquid Crystals: 2D IR Measurements and Mode Coupling Theory.** *journal of physical chemistry. B*
Sokolowsky, K. P., Bailey, H. E., Hoffman, D. J., Andersen, H. C., Fayer, M. D.
2016; 120 (28): 7003-7015
- **Structural and Rotational Dynamics of Carbon Dioxide in 1-Alkyl-3-methylimidazolium Bis(trifluoromethylsulfonyl)imide Ionic Liquids: The Effect of Chain Length** *JOURNAL OF PHYSICAL CHEMISTRY B*
Giammanco, C. H., Yamada, S. A., Kramer, P. L., Tamimi, A., Fayer, M. D.
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