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Education

Ph.D. Chemistry, University of California, Berkeley, 2016. Research Advisor: Graham R. Fleming
B.S. Chemistry, University of Chicago, 2012.

Positions and Employment

2022– Research Assistant Professor, University of Chicago Department of Chemistry
2017–2022 Postdoctoral Scholar, University of Chicago and James Franck Institute.
2019–2020 Thrust 1 Early Career Liaison, Advanced Materials for Energy-Water Systems EFRC.

Honors and Awards

2017 Yen Fellowship, University of Chicago.

Publications

Lewis, N.H.C., Dereka, B., Zhang, Y., Maginn, E.J., and A. Tokmakoff. From Networked to Isolated: Observing Water Hydrogen Bonds in Concentrated Electrolytes with Two Dimensional Infrared Spectroscopy. In Preparation.

Dereka, B., Lewis, N.H.C., Zhang, Y., Hahn, N.T., Keim, J.H., Snyder, S.A., Maginn, E.J., and A. Tokmakoff. Exchange-Mediated Transport in Battery Electrolytes: Ultrafast or Ultraslow? Under Review.

Dereka, B., Lewis, N.H.C., Keim, J.H., Snyder, S.A. and A. Tokmakoff. Characterization of Acetonitrile Isotopologues as Vibrational Probes of Electrolytes. *J. Phys. Chem. B.*, (2022).

Lewis, N.H.C, and A. Tokmakoff. Lineshape Distortions in Internal Reflection Two-Dimensional Infrared Spectroscopy: Tuning across the Critical Angle. *J. Phys. Chem. Lett.*, 12, 11843–11849 (2021).

Zhang, Y., Wan, G., Lewis, N.H.C., Mars, J., Bone, S., Steinrück, H.-G., Lukatskaya, M. R., Weadock, N., Bajdich, M., Borodin, O., Tokmakoff, A., Toney, M., and E. Maginn. Water or Anion? Uncovering Zn²⁺ Solvation Environment in Mixed Zn(TFSI)₂ and LiTFSI Water-in-Salt Electrolytes. *ACS Energy Lett.*, 6, 10, 3458–3463 (2021).

Barry, E., Burns, R., Chen, W., De Hoe, G.X., De Oca, J.M.M., de Pablo, J.J., Dombrowski, J., Elam, J.W., Felts, A.M., Galli, G., Hack, J., He, Q., He, X., Hoenig, E., Iscen, A., Kash, B., Kung, H.H., Lewis, N.H.C., Liu, C., Ma, X., Mane, A., Martinson, A.B.F., Mulfort, K.L., Murphy, J., Mølhave, K., Nealey, P., Qiao, Y., Rozyyev, Y., Schatz, G.C., Sibener, S.J., Talapin, D., Tiede, D.M., Tirrell, M.V., Tokmakoff, A., Voth, G.A., Wang, Z., Ye, Z., Yesibolati, M., Zaluzec, N.J., and S.B. Darling. *Advanced Materials*

for Energy-Water Systems: The Central Role of Water/Solid Interfaces in Adsorption, Reactivity, and Transport. *Chem. Rev.* **121**, 15, 9450–9501, (2021).

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Dereka, B., Yu, Q., Lewis, N.H.C., Carpenter, W.B., Bowman, J.M., and A. Tokmakoff. Crossover from Hydrogen to Chemical Bonding. *Science*, **371**, 160-164, (2021).

Ashwood, B., Lewis, N.H.C., Sanstead, P.J., and A. Tokmakoff. Temperature-Jump 2D IR Spectroscopy with Intensity-Modulated CW Optical Heating. *J. Phys. Chem. B*, **124**, 8665–8677, (2020).

Lewis, N.H.C., Iscen, A., Felts, A., Dereka, B., Schatz, G.C., and A. Tokmakoff. Vibrational Probe of Aqueous Electrolytes: The Field Is Not Enough. *J. Phys. Chem. B*, **124**, 7013–7026, (2020).

Lewis, N.H.C., Zhang, Y., Dereka, B., Carino, E.V., Maginn, E.J., and A. Tokmakoff. Signatures of Ion Pairing and Aggregation in the Vibrational Spectroscopy of Super-Concentrated Aqueous Lithium Bistriflimide Solutions. *J. Phys. Chem. C*, **124**, 3470–3481, (2020).

Yu, Q., Carpenter, W.B., Lewis, N.H.C., Tokmakoff, A., and J.M. Bowman. High-Level VSCF/VCI Calculations Decode the Vibrational Spectrum of the Aqueous Proton. *J. Phys. Chem. B*, **123**, 33, 7214–7224, (2019).

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Wu, E.C., Arsenault, E.A., Bhattacharyya, P., Lewis, N.H.C., and G.R. Fleming. Two-dimensional electronic vibrational spectroscopy and ultrafast excitonic and vibronic photosynthetic energy transfer. *Faraday Discuss.*, **216**, 116, (2019).

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Wu, E.C., Ge, Q., Arsenault, E.A., Lewis, N.H.C., Gruenke, N.L., Head-Gordon, M.J., and G.R. Fleming. Two-dimensional electronic-vibrational spectroscopic study of conical intersection dynamics: an experimental and electronic structure study. *Phys. Chem. Chem. Phys.*, **21**, 14153, (2019).

Lewis, N.H.C., Fournier, J.A., Carpenter, W.B., and A. Tokmakoff. Direct Observation of Ion Pairing in Aqueous Nitric Acid Using 2D Infrared Spectroscopy. *J. Phys. Chem. B*, **123**, 225–238 (2018).

Fournier, J.A., Carpenter, W.B., Lewis, N.H.C. and A. Tokmakoff. Broadband 2D IR spectroscopy reveals dominant asymmetric H_5O_2^+ proton hydration structures in acid solutions. *Nature Chem.*, **10**, 932–937 (2018).

Carpenter, W.B., Fournier, J.A., Lewis, N.H.C., and A. Tokmakoff. Picosecond Proton Transfer Kinetics in Water Revealed with Ultrafast IR Spectroscopy. *J. Phys. Chem. B*, **122**, 2792–2802 (2018).

Lewis, N.H.C., Oliver, T.A.A., Ballottari, M., Gruenke, N.L., Bassi, R. and G.R. Fleming. Observation of electronic excitation transfer through Light Harvesting Complex II using two-dimensional electronic-vibrational spectroscopy. *J. Phys. Chem. Lett.*, **7**, 4197-4206 (2016).

Lewis, N.H.C. and G.R. Fleming. Two-Dimensional Electronic-Vibrational Spectroscopy of Chlorophyll a and b. *J. Phys. Chem. Lett.*, **7**, 831-837 (2016).

Lewis, N.H.C., Dong, H., Oliver, T.A.A. and G.R. Fleming. A method for the direct measurement of electronic site populations in a molecular aggregate using two-dimensional electronic-vibrational spectroscopy. *J. Chem. Phys.*, 143, 124203 (2015).

Lewis, N.H.C., Dong, H., Oliver, T.A.A. and G.R. Fleming. Measuring correlated electronic and vibrational spectral dynamics using line shapes in two-dimensional electronic-vibrational spectroscopy. *J. Chem. Phys.*, 142, 174202 (2015).

Dong, H., Lewis, N.H.C., Oliver, T.A.A. and G.R. Fleming. Determining the static electronic and vibrational energy correlations via two-dimensional electronic-vibrational spectroscopy. *J. Chem. Phys.*, 142, 174201 (2015).

Oliver, T.A.A., Lewis, N.H.C., and G.R. Fleming. Correlating the motion of electrons and nuclei with two-dimensional electronic-vibrational spectroscopy. *PNAS USA*, 111, 10061-10066 (2014). See also corrections on Page 16628.

Caram, J.R., Lewis, N.H.C., Fidler, A.F. and G.S. Engel. Signatures of correlated excitonic dynamics in two-dimensional spectroscopy of the Fenna-Matthew-Olson photosynthetic complex. *J. Chem. Phys.*, 136, 104505 (2012).

Panitchayangkoon, G., Voronine, D.V., Abramavicius, D., Caram, J.R., Lewis, N.H.C., Mukamel, S. and G.S. Engel. Direct evidence of quantum transport in photosynthetic light-harvesting complexes. *PNAS USA*, 108, 20908-20912 (2011).

Conference Presentations

Lewis, N.H.C., Felts, A., Rozyyev, V., Bodine, M., Elam, J.W., Schatz, G.C., and A. Tokmakoff. Probing the Electric Field Dynamics at the Solid-Electrolyte Interface with 2D IR Spectroscopy and Molecular Dynamics Simulations. EFRC-Hub-CMS-CCS PI Meeting, Virtual, October, 2021. (Poster)

Lewis, N.H.C., Zhang, Y., Dereka, B., Maginn, E.J., and A. Tokmakoff. Probing Water and Ion Networks in Superconcentrated Aqueous Electrolytes with 2DIR Spectroscopy. Time Resolved Vibrational Spectroscopy, Virtual, June, 2021. (Poster)

Lewis, N.H.C., Dereka, B., and A. Tokmakoff. Probing the Water H-Bonding Network in Superconcentrated Aqueous Electrolytes with 2DIR Spectroscopy. APS March Meeting, Virtual, March, 2021. (Oral)

Lewis, N.H.C., Zhang, Y., Dereka, B., Carino, E.V., Maginn, E.J., and A. Tokmakoff. 2DIR Study of Ion-Pairing and Aggregation of Aqueous LiTFSI Electrolytes for Battery Applications. Chemistry and Physics of Liquids, Gordon Research Conference, Holderness, NH, August, 2019. (Poster)

Lewis, N.H.C., Zhang, Y., Dereka, B., Carino, E.V., Maginn, E.J., and A. Tokmakoff. 2DIR Study of Ion-Pairing and Aggregation of Aqueous LiTFSI Electrolytes for Battery Applications. Chemistry and Physics of Liquids, Gordon Research Seminar, Holderness, NH, August, 2019. (Oral)

Lewis, N.H.C., Iscen, A., Felts, A., Dereka, B., Schatz, G., and A. Tokmakoff. Carbonyl Vibrational Probe of Aqueous Electrolytes. EFRC PI Meeting, Washington, DC, August, 2019. (Poster)

Lewis, N.H.C., Fournier, J.A., Carpenter, W.B., and A. Tokmakoff. Ultrafast IR Spectroscopy of the Hydrated Proton and the Effects of Ion Pairing. The 9th International Conference on Coherent Multi-dimensional Spectroscopy, Seoul, South Korea, June, 2018. (Oral)

Lewis, N.H.C., Oliver, T.A.A., Ballottari, M., Gruenke, N.L., Bassi, R. and G.R. Fleming. Studying Spatio-Energetic Dynamics in Light Harvesting Complex II using Two-Dimensional Electronic-Vibrational Spectroscopy. International Conference on Ultrafast Phenomena 2016, Santa Fe, NM, July, 2016. (Oral)

Lewis, N.H.C., Oliver, T.A.A., Ballottari, M., Gruenke, N.L., Bassi, R. and G.R. Fleming. Studying Energy Transfer Dynamics in Light Harvesting Complex II using 2D Electronic-Vibrational Spectroscopy. The 8th International Conference on Coherent Multidimensional Spectroscopy, Groningen, The Netherlands, June, 2016. (Poster)

Lewis, N.H.C., Dong, H., Oliver, T.A.A. and G.R. Fleming. Measuring Electronic and Vibrational Correlations via Two-Dimensional Electronic-Vibrational Spectroscopy. Time Resolved Vibrational Spectroscopy 2015, Madison, WI, June 2015. (Poster)

Lewis, N.H.C., Dong, H., Oliver, T.A.A. and G.R. Fleming. Lineshape Dynamics in 2D Electronic-Vibrational Spectroscopy as a Measure of Correlated Spectral Dynamics of Electronic and Vibrational Degrees of Freedom. The American Physical Society March Meeting 2015, San Antonio, TX, March 2015. (Oral)

Lewis, N.H.C., Oliver, T.A.A., Seo, J.T., Hersam, M.C. and G.R. Fleming. Two-color Visible Mid-Infrared 2D Spectroscopy of Excited State Phonons and Intraband Transitions of Semiconducting Single Walled Carbon Nanotubes. The 7th International Conference on Coherent Multidimensional Spectroscopy, Eugene, OR, July, 2014. (Oral)