

Myungwoon Lee

EDUCATION

2014-2018	Massachusetts Institute of Technology Ph.D. in Physical Chemistry (Advisor: Prof. Mei Hong)	Cambridge, MA, USA
2012-2014	Iowa State University Ph.D. candidate in Biophysics (Advisor: Prof. Mei Hong)	Ames, IA, USA
2002-2006	University of Seoul B.S. in Physics	Seoul, Korea

Professional Experience

2023-	Assistant Professor Department of Chemistry, Drexel University	Philadelphia, PA, USA
2018-2022	Postdoctoral Fellow (Advisor: Dr. Robert Tycko) National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases	Bethesda, MD, USA
2006-2010	Senior Engineer Samsung Electronics Corporation, LCD Division	Giheung, Korea
	<ul style="list-style-type: none">• Enhancement of LCD performance through optical simulations• CAE (Computer-Aided Engineering) for incoherent light analysis	
2009	Member of Task force for Samsung Human resources Development Center Samsung Group	Seoul, Korea

RESEARCH EXPERIENCE

Ph.D. Research

Solid-state NMR studies of biological macromolecules

- Investigated the viral-cell membrane fusion induced by viral fusion proteins (PIV5 F, HIV gp41)
- Determining the structure and dynamics of membrane proteins and a metal-bound amyloid fibrils
- Optimizing the efficiency of dynamic nuclear polarization (DNP) in biological systems
- Investigation of the utilities of cryoprotectants to membranes and membrane peptides for high-resolution solid-state NMR at low temperature

Postdoctoral Research

Cryo-Electron Microscopy (Cryo-EM) and Cryo-Electron Tomography (Cryo-ET) for structural determination of protein assemblies

- Determining the structure and molecular interactions within FUS low complexity sequence fibrils
- Investigation of the structural polymorphism of amyloid β fibrils prepared by seeded growth from Alzheimer's disease cortical tissue
- Determining the structure of the SARS-CoV-2 nucleoprotein and RNA complex

NMR studies of biological complex

- Determining the dynamics of fibrils formed by FUS low complexity sequence
- Investigation of molecular interactions underlying liquid-liquid phase separation by low complexity sequence protein

TEACHING EXPERIENCE

2015 Teaching Assistant, Recitation of Laboratory Chemistry (MIT)

2014 Teaching Assistant, Recitation of Laboratory Chemistry (MIT)

PUBLICATIONS

S. Kim, **M. Lee**, M. Hong, H. A. Niels, “Quantitative Correlation between Bound Water and Mechanical Stress-relaxation in Dehydrated Metal-Coordinate Polymer Networks”, *Accepted by Chem. Mater.* (2022)

C. A. Roden, Y. Dai, C. Giannetti, I. Seim, **M. Lee**, R. Sealfon, G. A. McLaughlin, M. A. Boerneke, C. Iserman, S. A. Wey, J. L. Ekena, O. G. Troyanskaya, K. M. Weeks, L. You, A. Chilkoti, A. S. Gladfelter, “Double-stranded RNA drives SARS-CoV-2 Nucleocapsid Protein to Undergo Phase separation at Specific Temperatures”, *Nucleic Acids Res.* 50 (14), 8168-8192 (2022).

M. Lee, U. Ghosh, K.R. Thurber, M. Kato, R. Tycko, “Molecular Structure and Interactions within Amyloid-Like Fibrils Formed by a Low Complexity Protein Sequence from FUS”, *Nat. Commun.* 11, 5735 (2020).

M. Lee, C.M. Morgan, M. Hong, “Fully Hydrophobic HIV gp41 Adopts a Hemifusion-like Conformation in Phospholipid Bilayers”, *J. Biol. Chem.* 294, 14732-14744 (2019).

S. Y. Liao, **M. Lee**, M. Hong, “Interplay Between Membrane Curvature and Protein Conformational Equilibrium Investigated by Solid-State NMR”, *J. Struct. Biol.* 206 (1), 20-28 (2019).

M. Lee, B. Kwon, A. Waring, M. Hong, “Oligomeric Structure and Three-dimensional Fold of the HIV gp41 MPER and Transmembrane Domain in Phospholipid Bilayers”, *J. Am. Chem. Soc.* 140 (26), 8246-8259 (2018).

M. Lee, H. Yao, B. Kwon, A. Waring, P. Ruchala, C. Singh, M. Hong, “Conformation and Trimer Association of the Transmembrane Domain of the Parainfluenza Fusion Protein in Lipid Bilayers From Solid-State NMR: Insights into the Sequence Determinants of Fusion Activity and Trimer stability”, *J. Mol. Biol.* 430, 695-709 (2018).

M. Lee, T. Wang, O.V. Makhlynets, Y. Wu, N.P. Polizzi, H. Wu, P.M. Gosavi, J. Stöhr, I.V. Korendovych, W.F. DeGrado, M. Hong, “Zinc-Binding Structure of a Catalytic Amyloid from Solid-State NMR”, *Proc. Natl. Acad. Sci. USA* 114 (24), 6191-6196 (2017).

- Featured in **MIT News**: Chemists reveal amyloid structure: Discovery of how amyloids bind metal ions sheds light on protein function.

H.W. Yao, **M. Lee**, S. Y. Liao, and M. Hong, “Solid-State Nuclear Magnetic Resonance Investigation of the Structural Topology and Lipid Interactions of a Viral Fusion Protein Chimera Containing the Fusion Peptide and Transmembrane Domain”, *Biochemistry* 55, 6787-6800 (2016).

J. K. Williams, D. Tietze, **M. Lee**, J. Wang, and M. Hong, “Solid-State NMR Investigation of the Conformation, Proton Conduction, and Hydration of the Influenza B Virus M2 Transmembrane Proton Channel”, *J. Am. Chem. Soc.* 138, 8143-8155 (2016).

S. Y. Liao, **M. Lee**, T. Wang, I. Sergeyev, and M. Hong, “Efficient Dynamic Nuclear Polarization NMR of Membrane Proteins: Optimal Sample Preparation Protocols, Sensitivity and Resolution Assessment, and Radical Location”, *J. Biomol. NMR* 64, 223-237 (2016).

M. Lee and M. Hong, “Cryoprotection of Lipid Membranes for High-Resolution Solid-State NMR Studies of Membrane Peptides and Proteins at Low Temperature”, *J. Biomol. NMR* 59, 263-277 (2014).

ACADEMIC PRESENTATIONS

M. Lee, U. Ghosh, K.R. Thurber, M. Kato, and R. Tycko, “FUS low complexity domain fibril structure by Cryo-electron microscopy and solid-state NMR”, Early Career Research Symposium on Experimentally Determined High Resolution Structures of Amyloid Proteins, Mar 2022 (**Talk**).

M. Lee, M. Kato, U. Ghosh, and R. Tycko, “Molecular Structure and Interactions Within Fibrils Formed by a FUS Low Complexity Domain”, Federation of American Societies For Experimental Biology (FASEB) The Protein Aggregation Conference: Function, Dysfunction, and Disease, June 2021 (**Talk**).

M. Lee, M. Kato, U. Ghosh, and R. Tycko, “Molecular Structure and Interactions Within Fibrils Formed by a FUS Low Complexity Domain”, Federation of American Societies For Experimental Biology (FASEB), 2nd NextGen Symposium on Protein Aggregation, June 2021 (**Talk**).

M. Lee, M. Kato, U. Ghosh, and R. Tycko, “Molecular Structure and Interactions Within Amyloid Fibrils Formed by a FUS Low Complexity Domain”, American Chemical Society, Apr 2021 (**Talk**).

M. Lee, M. Kato, U. Ghosh, and R. Tycko, “FUS Low Complexity Domain Fibril Structure by Cryo-Electron Microscopy and Solid-state NMR”, 65th Biophysical Society Annual Meeting, Feb 2021.

M. Lee, B. Kwon, H. Yao, C. Singh, and M. Hong, “Membrane-bound Structure and Oligomeric Assembly of Viral Fusion Proteins by Solid-State NMR”. 59th Experimental Nuclear Magnetic Resonance Conference, Orlando, FL, USA, Apr 2018.

M. Lee, H. Yao, B. Kwon, A. Waring, and M. Hong, “Conformation and oligomeric structure of viral fusion protein transmembrane domains by solid-state NMR”. 58th Experimental Nuclear Magnetic Resonance Conference, Asilomar, CA, USA, Mar 2017.

M. Lee, T. Wang, O.V. Makhlynets, Y. Wu, N.P. Polizzi, H. Wu, P.M. Gosavi, J. Stöhr, I.V. Korendovych, W.F. DeGrado, M. Hong, “Metal-binding structure of a catalytic amyloid by solid-state NMR spectroscopy”. 58th Experimental Nuclear Magnetic Resonance Conference, Asilomar, CA, USA, Mar 2017.

M. Lee, “Zinc coordination structure of a catalytic amyloid fibril from SSNMR”. NIH P41 advisory meeting MIT-Harvard Center for Magnetic Resonance, Francis Bitter Magnet Laboratory, MIT. Cambridge, MA, USA, July 2016 (**Talk**).

S. Liao, **M. Lee**, T. Wang, I.V. Sergeyev, and M. Hong, “Efficient Dynamic Nuclear Polarization NMR of membrane proteins: Optimal sample preparation, sensitivity and resolution assessment, and radical location”. 4th U.S.-Canada Winter School on Biomolecular Solid-State NMR, Stowe, VT, USA, Jan 2016.

J. Ha, J. Paek, T. Jang, Y. Jung and **M. Lee**, “A new cost-effective optical plate for high performance LCD-TVs”, 7th International Meeting on Information Display (IMID 2007) held from August 27 to 31, 2007 in Daegu, Korea.

AWARDS AND HONORS

2017 Morse Travel stipend
2005 Financial Aid Scholarship-The 2nd Term of 2005
2005 Scholarship For Excellent Achievement-The 1st Term of 2005
2004 Scholarship For Excellent Achievement-The 1st Term of 2004
2003 Financial Aid Scholarship-The 1st Term of 2003

PATENTS

2014 Diffusion plate and display apparatus having the same Patent No. 8628231
2012 Optical plate, method of manufacturing the same and liquid crystal having the same
Patent No. 8310622
2011 Diffusion plate and display apparatus having the same Patent No. 8052319
2011 Display Apparatus Publication No. 20110267841
2010 Diffusion plate and display apparatus having the same Publication No. 20100321923
2010 Diffusion plate and display apparatus having the same Publication No. 20100124043
2009 Optical plate, method of manufacturing the same and liquid crystal having the same
Publication No. 20090167986
2009 Backlighting assembly for use in slim flat panel display and display device having same
Publication No. 20090168421