

# Leo W. Gordon

leowilliamgordon@gmail.com | +1 (917) 742-7804  
LinkedIn | Personal Website | GitHub

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## EDUCATION

**THE CITY COLLEGE OF NEW YORK (CCNY)** | PhD, Chemical Engineering  
Graduated March 2023 | New York, NY

**THE CITY COLLEGE OF NEW YORK (CCNY)** | MPhil, Chemical Engineering  
Graduated January 2021 | New York, NY

**UNIVERSITY OF EDINBURGH** | MChem, Chemistry  
Graduated July 2017 | Edinburgh, U.K.

## RESEARCH ACTIVITIES

**CLÉMENT LAB** | Postdoctoral Scholar  
UCSB | May 2023 - Present | Santa Barbara, CA

- Determination of ionic diffusion through polymeric materials by applications of pulsed-field gradient and electrophoretic NMR measurements
- Studying both partitioning behaviours and transport processes in multi-phasic systems using spatially-resolved NMR techniques
- Probing ion-ion and ion-solvent interactions via their coupled diffusion, as compared to equilibrium models of ion dissociation

**MESSINGER LAB** | PhD Student  
CCNY | November 2018 – May 2023 | New York, NY

- Applying advanced solid-state NMR methodologies to establish ionic and electronic charge storage mechanisms in quinone electrodes for aluminum batteries
- NMR characterization of molten-salt electrolytes in liquid and heterogeneous samples to develop understanding of reaction processes following electrochemical cycling
- Quantum chemical calculations to determine thermochemical viability of ion generation pathways and quadrupolar NMR parameters of electroactive ions
- Evaluating reaction schemes via NMR to characterize the modification of  $\text{LiPF}_6$  by  $\text{P}_2\text{O}_5$  for long-life and low hysteresis lithium-metal batteries
- Investigating chalcogen electrodes for rechargeable aluminum batteries, studying the impacts of structure at different length-scales to the resultant reactions
- Understanding a novel non-intensive recycling process for lithium-ion battery cathodes by NMR analysis, in combination with complimentary techniques

**BIDDINGER LAB** | Summer Researcher  
CCNY | Summer 2018 | New York, NY

- Performed preliminary work for surface-enhanced FTIR studies of reaction pathways in the electrochemical upgrading of bio-oils derived from otherwise wasted feedstocks to bio-fuels

**KAMPOURIS LAB** | Masters Research  
University of Edinburgh | September 2016 - April 2017 | Edinburgh, U.K.

- Investigated the design of microelectrode arrays, in particular the impact of reference electrode positioning producing stacked, one-dimensional microelectrode arrays of working electrodes and coupled reference electrodes. This work was performed in the clean-room environment of the Scottish Microelectronics Centre

## LEADERSHIP & WORK EXPERIENCE

### **TREASURER** | ECS Student Chapter

ECS | 2021-2023 | New York, NY

- Key leadership position organizing and running events pertaining to electrochemistry

### **EXECUTIVE COMMITTEE - TREASURER** | Graduate Student Council

CCNY | Academic Year 2019-2020 | New York, NY

- Created budgets to fund all graduate clubs on campus, and host a graduate student symposium
- Reworked all budgeting to match the new financial conditions brought by the COVID-19 pandemic

### **TEACHING ASSISTANT FOR THERMODYNAMICS I & II** | Department of Chemical Engineering

CCNY | Spring 2020-Spring 2022 | New York, NY

- Delivered lectures to classes and performed weekly recitations to class of 75 people
- Addressed concerns and questions of the class through individual emails and Zoom calls
- Reevaluated teaching approach due to the COVID-19 pandemic, utilizing virtual media

### **TECHNICAL SPECIALIST** | Genius Bar

Apple Inc. | 2014-2017 | Edinburgh, U.K.

- Troubleshooted customer issues and performed device repairs
- Aligned with customers, establishing mutual empathy to de-escalate situations

## AWARDS AND FELLOWSHIPS

### **242ND ELECTROCHEMICAL SOCIETY MEETING TRAVEL AWARD**

ECS | October 2022 | Atlanta, GA

### **GLOBAL NMR TWITTER CONFERENCE 2022 POSTER AWARD**

Global NMR Discussions | August 2022 | Twitter

### **ROCKY MOUNTAIN CONFERENCE (RMC) ON MAGNETIC RESONANCE TRAVEL AWARD**

RMC | July 2022 | Copper Mountain, CO

### **EXPERIMENTAL NUCLEAR MAGNETIC RESONANCE CONFERENCE TRAVEL AWARD**

ENC | April 2022 | Orlando, FL

### **GROVE SCHOOL OF ENGINEERING FELLOWSHIP**

CCNY | Academic Year 2020-2021 | New York, NY

### **ACRIVOS FELLOWSHIP**

CCNY | Academic Year 2018-2019 | New York, NY

## LANGUAGES

### **SPOKEN & WRITTEN**

English - Native

German - Intermediate

### **PROGRAMMING**

Matlab, Python - Proficient

HTML - Basic

## REFERENCES

### **PROF. RAPHAËLE CLÉMENT**

University of California, Santa Barbara

3009 Materials Research Lab,  
Santa Barbara, CA 93106, USA

rclement@ucsb.edu

### **PROF. ROBERT J. MESSINGER**

The City College of New York

Steinman Hall, 160 Convent Ave.,  
New York, NY 10031, USA

rmessinger@ccny.cuny.edu

### **PROF. ILONA KRETZSCHMAR**

The City College of New York

Steinman Hall, 160 Convent Ave.,  
New York, NY 10031, USA

ikretzschmar@ccny.cuny.edu

### **PROF. JUCHEN GUO**

University of California, Riverside

900 University Ave.,  
Riverside, CA 92521, USA

jguo@engr.ucr.edu

## PUBLICATIONS

- [1] Oi Man Leung, Leo W. Gordon, Robert J. Messinger, Themis Prodromakis, Julian A. Wharton, Carlos Ponce de León, and Theresa Schoetz. Solid polymer electrolytes with enhanced electrochemical stability for high-capacity aluminum batteries. *Advanced Energy Materials*, 2303285, Jan 2024.
- [2] Brendan E. Hawkins, Theresa Schoetz, Leo W. Gordon, Surabh KT, Jonah Wang, and Robert J. Messinger. Reversible Zinc Electrodeposition at  $-60\text{ }^{\circ}\text{C}$  Using a Deep Eutectic Electrolyte for Low-Temperature Zinc Metal Batteries. *The Journal of Physical Chemistry Letters*, 14(9):2378–2386, Mar 2023.
- [3] Leo W. Gordon, Jonah Wang, and Robert J. Messinger. Revealing impacts of electrolyte speciation on ionic charge storage in aluminum-quinone batteries by NMR spectroscopy. *Journal of Magnetic Resonance*, 348:107374, Mar 2023.
- [4] Atanu Roy, Theresa Schoetz, Leo W. Gordon, Hung-Ju Yen, Qingli Hao, and Daniel Mandler. Formation of a CoMn-layered double hydroxide/graphite supercapacitor by a single electrochemical step. *ChemSusChem*, e202201418, Aug 2022.
- [5] Leo W. Gordon, Ankur L. Jadhav, Mikhail Miroshnikov, Theresa Schoetz, George John, and Robert J. Messinger. Molecular-scale elucidation of ionic charge storage mechanisms in rechargeable aluminum–quinone batteries. *The Journal of Physical Chemistry C*, 126:14082–14093, Aug 2022.
- [6] Jian Zhang, Jiayan Shi, Leo W. Gordon, Nastaran Shojarazavi, Xiaoyu Wen, Yifan Zhao, Jianjun Chen, Chi-Cheung Su, Robert J. Messinger, and Juchen Guo. Performance leap of lithium metal batteries in  $\text{LiPF}_6$  carbonate electrolyte by a phosphorus pentoxide acid scavenger. *ACS Applied Materials & Interfaces*, 14:36679–36687, Aug 2022.
- [7] Rahul Jay, Ankur L. Jadhav, Leo W. Gordon, and Robert J. Messinger. Soluble electrolyte-coordinated sulfide species revealed in Al–S batteries by nuclear magnetic resonance spectroscopy. *Chemistry of Materials*, 34:4486–4495, May 2022.
- [8] T. Schoetz, L.W. Gordon, S. Ivanov, A. Bund, D. Mandler, and R.J. Messinger. Disentangling faradaic, pseudocapacitive, and capacitive charge storage: A tutorial for the characterization of batteries, supercapacitors, and hybrid systems. *Electrochimica Acta*, 412:140072, Feb 2022.

## CONFERENCE PRESENTATIONS

### **EXPERIMENTAL NUCLEAR MAGNETIC RESONANCE (ENC) CONFERENCE** | April 2023

"Impacts of Electrolyte Speciation on Ion Binding Environments in Aluminum-Quinone Batteries Elucidated by Dipolar-Mediated and Multiple-Quantum Solid-State NMR Methods," Experimental Nuclear Magnetic Resonance Conference (ENC), 16-20 April 2023, Asilomar, CA.

### **BATTERY & ENERGY STORAGE (BES) CONFERENCE** | October 2022

"Impacts of Electrolyte Speciation on Aluminum-Organic Battery Charge Storage," Battery and Energy Storage (BES) Workshop, 26-28 October, 2022, New York, NY.

### **ELECTROCHEMICAL SOCIETY (ECS) MEETING** | October 2022

"Understanding Improved Lifetimes of Lithium-Metal Batteries LiPF<sub>6</sub> Carbonate Electrolyte Modified by Phosphorus Pentoxide," Electrochemical Society (ECS) Meeting, 9-13 Oct. 2022, Atlanta, GA.

### **GLOBAL NMR TWITTER CONFERENCE** | August 2022

"Electrochemical Complexation of Polyatomic Aluminum Ions to Heterogeneous Organic Electrode Samples Investigated Using Solid-State Dipolar-Mediated NMR Methods," Global NMR Twitter Conference, 3-5 August 2022, Virtual.

### **ROCKY MOUNTAIN CONFERENCE (RMC) ON MAGNETIC RESONANCE** | July 2022

"Electrochemical Complexation of Polyatomic Aluminum Ions to Heterogeneous Organic Electrode Samples Investigated Using Solid-State Dipolar-Mediated NMR Methods," Rocky Mountain Conference on Magnetic Resonance (RMC), 25-29 July 2022, Copper Mountain, CO.

### **EXPERIMENTAL NUCLEAR MAGNETIC RESONANCE (ENC) CONFERENCE** | April 2022

"Molecular Structures of Reaction Products in LiPF<sub>6</sub> Carbonate Electrolyte with a Phosphorous Pentoxide Scavenger for Rechargeable Lithium Metal Batteries," Experimental Nuclear Magnetic Resonance Conference (ENC), 24-29 April 2022, Orlando, FL.

### **AMERICAN INSTITUTE FOR CHEMICAL ENGINEERS (AIChE) CONFERENCE** | November 2021

"Charge Storage Mechanisms of Quinone- & Flavin-Type Organic Electrodes for Rechargeable Aluminum Batteries Elucidated with Molecular-level Specificity," AIChE Annual Meeting, 7-12 Nov. 2021, Boston, MA.

### **ELECTROCHEMICAL SOCIETY (ECS) MEETING** | October 2021

"Electrochemical Complexation of Polyatomic Aluminum Cations in Quinone-type Organic Battery Electrodes Revealed by Solid-state NMR," Electrochemical Society (ECS) Meeting, 10-14 Oct. 2021, Virtual.

### **EXPERIMENTAL NUCLEAR MAGNETIC RESONANCE (ENC) CONFERENCE** | March 2021

"Molecular-level Insights into the Charge Storage Mechanisms of Rechargeable Aluminum-Indanthrone Quinone Batteries Revealed by Solid-state NMR Spectroscopy," Experimental Nuclear Magnetic Resonance Conference (ENC), 29-31 March 2021, Virtual.

### **BATTERY & ENERGY STORAGE (BES) CONFERENCE** | October 2020

"Molecular-level Investigation into the Charge-storage Mechanisms of Rechargeable Aluminum-organic Batteries," Battery and Energy Storage (BES) Workshop, 21-23 October 2020, Virtual.

### **ELECTROCHEMICAL SOCIETY (ECS) MEETING** | October 2020

"Molecular-Scale Understanding of Charge Storage Mechanisms in Organic Positive Electrode Materials for Rechargeable Aluminum Batteries," Electrochemical Society (ECS) Meeting, 4-9 October, 2020, Virtual.

### **BATTERY & ENERGY STORAGE (BES) CONFERENCE** | October 2019

"Rechargeable Aluminum Batteries Using Organic Cathode Materials with High Cycle Life and Capacity," Battery and Energy Storage (BES) Workshop, 21-22 October, 2019, New York, NY.