



Exponent[®]
Engineering & Scientific Consulting

Drew Ells, Ph.D.

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Professional Profile

Dr. Ells is a trained chemical engineer specializing in battery technologies at the materials and cell level. He has extensive research experience in lithium and beyond-lithium battery chemistries, leveraging electrochemistry and materials characterization methods to conduct failure analyses and improve performance of electrolytes and electrodes. At Exponent, he conducts root cause failure investigations, performance evaluations, and quality assessments of batteries for industries ranging from consumer electronics to stationary storage.

Dr. Ells's deep analytical expertise includes techniques such as linear sweep and cyclic voltammetry (LSV and CV), electrochemical impedance spectroscopy (EIS), nuclear magnetic resonance (NMR), X-ray photoelectron spectroscopy (XPS), X-ray diffraction (XRD), and computed tomography (CT).

Prior to joining Exponent, Dr. Ells conducted graduate research at Columbia University as a National Defense Science and Engineering Graduate (NDSEG) Fellow. He developed design rules for potassium-ion batteries by characterizing electrolyte decomposition pathways and relating them to performance metrics such as cell lifetime and rate capability.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, Columbia University in the City of New York, 2024

M.S., Chemical Engineering, Columbia University in the City of New York, 2021

B.S., Chemical Engineering, Washington University in St. Louis, 2019

B.S., Systems Engineering, Washington University in St. Louis, 2019

National Defense Science and Engineering Graduate Research Fellowship, 2020

National Science Foundation Graduate Research Fellowship, 2020

Publications

Ells A, Buitrago Botero P, Schumacher B, Bhai L, Marbella L. Fluoride-free surface passivation enables low-concentration nonflammable electrolytes for K-ion batteries. *ACS Applied Energy Materials* 2024; 7:10245–10250.

Ells A, Evans M, Groh M, Morris A, Marbella L. Phase transformations and phase segregation during potassiation of SnxPy anodes. *Chemistry of Materials* 2022; 34 7460–7467.

Ells A, May R, Marbella L. Potassium fluoride and carbonate lead to cell failure in potassium-ion batteries. *ACS Applied Materials & Interfaces* 2021; 13 53841–53849.

He C, Sankarasubramanian S, Ells A, Parrondo J, Gumecci C, Kodali M, Matanovic I, Yadav A, Bhattacharyya K, Dale N, Atanassov P, Ramani V. Self-anchored platinum-decorated antimony-doped-tin oxide as a durable oxygen reduction electrocatalyst. *ACS Catalysis* 2021; 11 7006–7017.

Hestenes J, Ells A, Navarro Goldaraz M, Sergeev I, Itin B, Marbella L. Reversible deposition and stripping of the cathode electrolyte interphase on Li₂RuO₃. *Frontiers in Chemistry* 2020; 8 681.

Fu C, Venturi V, Kim J, Ahmad Z, Ells A, Viswanathan V, Helms B. Universal chemomechanical design rules for solid-ion conductors to prevent dendrite formation in lithium metal batteries. *Nature Materials* 2020; 19:758–766.

Presentations

Ells, A. Design strategies for K-ion batteries. Poster presentation, Batteries Gordon Research Seminar and Conference, Ventura, CA, 2024.

Ells, A. Defining electrolyte design principles for K batteries using NMR spectroscopy. Poster presentation, International Battery Association Meeting, Austin, TX, 2023.

Ells, A. Informing K-ion battery design with nuclear magnetic resonance techniques. Invited presentation, American Chemical Society Northeast Regional Meetup, Rochester, NY, 2022.

Ells, A. Potassium fluoride and carbonate lead to cell failure in K-ion batteries. Poster presentation, Batteries Gordon Research Seminar and Conference, Ventura, CA, 2022.

Ells, A. Potassium fluoride and carbonate lead to cell failure in K-ion batteries. Poster presentation (Best Poster nomination) Materials Research Society Meeting, Honolulu, HI, 2022.