Jack Taylor M.A. M.Sci.

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Quick Introduction

I am a fourth year PhD student at the University of Cambridge, specialising in electrochemical methods of CO_2 capture. My formal education is in chemistry, and I have extensive experience in supervising the Cambridge chemistry course (first and second year) to undergraduates. My specialised skills include electrochemistry, flow-system design, NMR spectroscopy and excellent python proficiency.

Research Publications

Journal Articles

1. **Impacts of Quinone Structure on Trade-Offs Between Redox Potential and CO2 Binding Strength**
   ChemPhysChem
   J. Taylor, A. C. Forse, and A. J. W. Thom
   DOI: 10.1002/cphc.202500472.

2. **Electrochemical CO2 Capture by a Quinone-Based Covalent Organic Framework**
   Journal of the American Chemical Society
   M. A. Khan, Z. Xu, M. Muzammil, S. Bird, M. Munawar, F. Salam, N. A. Hartley, **J. Taylor**, K. Amin, J. Ling, H. R. N. B. Enninful, N. Z. Ali, K. Hetze, S. Cao, Y. Lu, Z. Wei, M. Oschatz, P. J. Milner, and A. C. Forse
   DOI: 10.1021/jacs.5c12304.

3. **Capturing carbon dioxide from air with charged-sorbents**
   Nature
   H. Li, M. E. Zick, T. Trisukhon, M. Signorile, X. Liu, H. Eastmond, S. Sharma, T. L. Spreng, **J. Taylor**, J. W. Gittins, C. Farrow, S. A. Lim, V. Crocellà, P. J. Milner, and A. C. Forse
   DOI: 10.1038/s41586-024-07449-2.

Articles in Review

1. **Why CO2 Capture via Supercapacitive Swing Adsorption Needs a Theory, Not Just Tweaks**
   Chemical Science
   M. Seyffertitz, Z. Coady, C. Walsh, S. E. Wiesner, **J. Taylor**, G. E. Mapstone, and A. C. Forse.

Articles in Preparation

1. **Electrochemical pH Swing Is the Mechanism of Carbon Capture in Supercapacitive Swing Adsorption**
   M. Seyffertitz, **J. Taylor**, Z. Coady, C. Walsh, G. Monica, and A. C. Forse.

2. **The Inaccuracy of Standard Cyclic Voltammetry Methods for Measuring CO2 Binding Constants of Quinones in Aprotic Organic Solvents**
   J. Taylor, A. C. Forse, and A. J. W. Thom.

3. **Using On-Line NMR Spectroscopy to Investigate the Mechanism of CO2 Capture in an Aqueous Quinone-Based Redox Flow Battery**
   J. Taylor, T. Kress, A. Abdulrahman, S. Pugh, E. Jones, E. Latchem, S. Wiesner, A. J. W. Thom, and A. C. Forse.

Education

2022 – **Ph.D. University of Cambridge**.
Ongoing. Experimental and Computational studies to unravel the mechanisms of CO_2 capture in electrochemical systems.

2003 – 2006 **M.Sci. University of Cambridge**
Thesis title: *An Investigation into the Capabilities of Quinone Imines for Electrochemical CO_2 Capture and Storage*.

2018 – 2021 **B.A. University of Cambridge**
Natural Sciences, specialising in chemistry.

Skills

Electrochemistry — Three-electrode cyclic voltammetry to measure redox potentials and CO_2 binding constants of quinones in DMSO. Operation and analysis of an organic aqueous redox-flow battery primarily using GCD charging/discharging profiles. Operation and analysis of a flowing porous-carbon electrode aqueous supercapacitor using both cyclic voltammetry and GCD charging/discharging profiles.

NMR Spectroscopy — During my PhD I used in-situ NMR spectroscopy to continuously monitor reservoir composition of a redox-flow battery to obtain a mechanistic understanding of the CO_2 capture mechanism. This involved measuring T_1 times of present species to ensure quantitative analysis and development of a specialised setup to allow for continuos flow of reservoir material through the NMR spectrometer, as well as data analysis.

Coding — Excellent proficiency in Python, especially with the numpy, matplotlib and scipy libraries. I take pride in writing optimised algorithms and taking care to design accurate and visually pleasing figures to present my generated data.

Git — I have contributed to and performed code reviews on in-house python projects during my PhD, as well as hosting my own projects on GitLab. During these collaboration I have become proficient at writing and reviewing unit tests, in this case with pytest.

Teaching — Over 150 hours of experience teaching chemistry to undergraduates at the University of Cambridge. This has been a wonderful opportunity, allowed me to gain a deeper understanding of the course material, and has improved my ability to explain challenging concepts.

Innovation — Building physical solutions to problems is something I am both good at and enjoy. As well as designing a novel flow-supercapacitor system, I have written software from the ground-up for talking to and controlling lab equipment such as mass flow controllers and CO_2 sensors.

Mentorship — I devised an academically interesting and novel masters project for a student who I subsequently supervised from October 2025 until June 2025. This was a fantastic opportunity and allowed me to direct a scientific endeavour from a more managerial position.

Python Projects

ECAnalyse https://gitlab.developers.cam.ac.uk/ch/forse/ecanalyse
A package designed for analysis specifically of super capacitor systems.

ECSimulate https://gitlab.developers.cam.ac.uk/ch/forse/ecsimulate
A package for modelling cyclic voltammetry with coupled first-order chemical reactions.

JackLab https://gitlab.com/JackScottTaylor/JackLab
A GUI for controlling and monitoring lab equipment over serial connections.