Speaker's Information

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Biography	Professor Mauro Pasta is Professor of Applied Electrochemistry in the Department of Materials at the University of Oxford. He received his BSc, MSc, and PhD in Industrial Chemistry from the University of Milan, Italy, and subsequently carried out postdoctoral research in the Department of Materials Science and Engineering at Stanford University. Professor Pasta's research lies at the interface of electrochemistry and materials science, with a focus on developing battery chemistries beyond lithium-ion. His work aims to achieve a mechanistic understanding of solid electrode interphases and their relationship to bulk electrolyte properties, with the goal of enabling the rational design of next-generation electrolytes. In addition to his academic research, Professor Pasta is strongly committed to translating fundamental science into real-world impact. He currently leads the SOLBAT (solid-state lithium metal anode) programme at the Faraday Institution, which seeks to accelerate the development of solid-state battery technologies. He is a co-founder of four battery start-ups, through which he aims to accelerate the commercial deployment of next-generation energy storage solutions. Over the course of his career, Professor Pasta has received multiple honours, including the Corday–Morgan Prize (2025) and the Piontelli Award (2017), and was elected a Fellow of the Royal Society of Chemistry (FRSC) in 2021.		
Lecture Title	**Operando Raman Gradient Analysis for Electrolyte Design**		
Abstract	Electrolytes are central to the operation of rechargeable batteries. They determine how rapidly ions are transported through the cell, control charge transfer at electrode surfaces, and form interphases that ultimately govern stability and cycle life. Yet these processes are commonly studied independently, making it difficult to establish how electrolyte chemistry translates into electrochemical performance. A central focus of our work has been the development of Operando Raman Gradient Analysis (ORGA), an experimental framework that combines electrochemical measurements with operando Raman microspectroscopy[1]. By spatially resolving concentration gradients that develop during electrochemical polarisation, ORGA enables the simultaneous determination of concentration-dependent transport and thermodynamic properties, while Raman spectroscopy provides molecular-level information on changes in ion solvation and speciation[2,3]. More recently, we have increased the throughput of ORGA to rapidly generate internally consistent datasets spanning transport, thermodynamics, interfacial behaviour and solvation across electrolyte composition space[4]. The information-rich datasets generated by ORGA provide a foundation for exploring relationships between capability and cycle life, and for moving beyond empirical electrolyte screening towards descriptor-based electrolyte design. **References**		

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2. Zhao, J. *et al.* Impact of concentration-dependent transport properties on concentration gradients. *J. Electrochem. Soc.* **172**, 080507 (2025).
3. Zhao, J. *et al.* Transport and Thermodynamic Properties of KFSI in TEP by Operando Raman Gradient Analysis. *ACS Energy Lett.* **9**, 1537–1544 (2024).
4. Zhao, J., Jagger, B., Sun, S., Xu, Y. & Pasta, M. Operando Raman Gradient Analysis for data-driven electrolyte discovery. *ChemRxiv* (2025) doi:10.26434/chemrxiv-2025-rvxkb.

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