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#ICMolTalks

Prof. Phoebe Allan

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University of Birmingham

October 17th - 11:15h

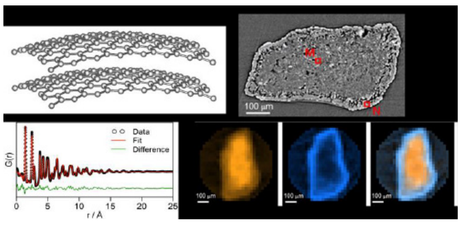
Seminario SS6

Abstract

In situ local structural studies of materials for energy applications

In situ local structural studies of materials for energy applications
Phoebe Allan, University of Birmingham.
In situ studies – where the structure of a material is monitored when it is placed in its operational conditions – are the gold-standard for linking the structure of a material with its physical properties. This talk will outline the development and application of in situ structural studies using synchrotron radiation to materials used in energy applications, with a particular focus on how the local structure impacts the material properties and how this information can be used to optimise materials for their application. Examples will include the use of in situ pair distribution function analysis to reveal the charge storage mechanisms of lithium-/sodium-ion battery materials, and image guided microdiffraction to develop new composite zeolite materials for the remediation of nuclear waste.

Reed, J. A. L., Allan, P. K. et al., Chemical Science, 2024, 15, 13699-13711.
Stratford, J. M., Allan, P. K. et al., J. Am. Chem. Soc., 2021, 143 (35), 14274-14286.
Driscoll, L.L, et al., Energy & Environmental Science, 2023, 16 (11) 5196



Biography

Prof. Allan studied Physical Natural Sciences at the University of Cambridge from 2004 - 2008. Her final year project focused on the synthesis and characterisation of metal-organic frameworks using phosphine-based ligands, under the supervision of Dr Simon Humphrey.

She completed a PhD with Professor Russell Morris FRS at the University of St Andrews in 2012, where she worked on the storage of medical gases using metal-organic frameworks. She was a Post-Doctoral Research Fellow in the group of Professor Clare Grey FRS from 2012 – 2013, then held a Junior Research Fellow at Gonville and Caius College, and an Oppenheimer Fellowship from the School of Physical Sciences, University of Cambridge from 2013 – 2018. Here, her research focused on developing synchrotron-based studies to understand and develop new electrodes for lithium and sodium-ion batteries.

From 2015 – 2017, she has also worked as a beamline support scientist at Diamond Light Source - the UK's synchrotron source, developing sample environments for diffraction and imaging beamlines, and later working on the design of the new Dual Imaging and Diffraction (DIAD) beamline which became operational in 2020.

Her research focuses on materials chemistry for energy storage. The goal of her research is to understand the links between the structure of a material, and its electrochemical properties, using techniques including: synchrotron X-ray and neutron powder diffraction, pair distribution function analysis, and spectroscopic techniques (Raman, NMR, X-ray adsorption spectroscopy). A particular interest is developing experiments which probe the structure of a material as it changes, in real-time, and under operational conditions. This approach gives insight into which structural features are desirable for obtaining new materials with improved performance.

Current areas of interest include new electrode and electrolyte materials for lithium- and sodium- and aluminium-ion batteries.

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