# Solid-state NMR of Surfaces and Interfaces in Energy Materials

I will present three examples of how solid-state NMR can selectively determine the atomic-scale structure of emerging functional materials to guide the development of next-generation devices:

- Harnessing the greater polarisation of unpaired electrons in lithium metal using dynamic nuclear polarisation allows selective observation of the metal–SEI interface in lithium metal batteries. This critically determines the nucleation of dendrites, which can short circuit the battery and cause fires. [10.1038/s41467-020-16114-x]

- Oxide vertically aligned nanocomposites (VANs) have extremely high interfacial areas, leading to enhanced oxide-ion conductivity. $^{17}O$ NMR combined with selective isotopic labelling and random structure searching calculations reveal the interface structure and the mechanism of enhanced conductivity. [10.1021/acs.chemmater.0c02698]

- MXenes are a class of layered two-dimensional transition metal carbides with promising applications including energy storage and gas separation. NMR reveals the surface functionalisation of these materials, which control the device performance. [10.1039/C6CP00330C, 10.1021/jacs.0c09044]

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Michael is an assistant professor in the Department of Chemistry at the University of Warwick, UK. His research focuses on the use of solid-state NMR and complementary techniques to characterise functional materials at the atomic scale. Michael is particularly interested in materials for energy storage and generation, such as materials for batteries and solar cells, to help combat the growing climate crisis.

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