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Solid-state NMR insights into functional materials

Materials' function is underpinned by long-range (or average) and local crystal and electronic structure features. While diffraction techniques typically inform on the long-range structure of a crystalline material, solid-state NMR is a valuable tool for probing interactions between nuclei, and between nuclei and electrons, and provides detailed insights into the local atomic and electronic structure. In this lecture, I will provide a brief overview of NMR principles and interactions, before focusing on applications of solid-state NMR to better understand the properties of technologically-relevant materials. Case studies from the fields of rechargeable batteries, solid-state lighting, and quantum information science and technology will be presented.

Raphaële Clement is an Assistant Professor in the Materials Department at the University of California Santa Barbara (UCSB). She received her Ph.D. in Chemistry in 2016 from the University of Cambridge, working under the supervision of Prof. Clare Grey. Her doctoral work focused on the study of layered sodium transition metal oxide cathodes for Na-ion secondary batteries. She then joined the group of Prof. Gerbrand Ceder at the University of California Berkeley (UC Berkeley), focusing on cation-disordered rocksalt oxyfluorides for Li-ion battery applications. She joined the Faculty at UCSB in 2018. Her primary research focus is the development and implementation of magnetic resonance techniques (experimental and computational) for the study of battery materials and beyond, with a strong emphasis on *operando* tools. She is an Associate Editor for *Battery Energy*, a new open access journal by Wiley.