MS42-02 | Neutron Diffraction Studies of Energy Materials

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The increasing demand for new, cheap and environmentally benign technologies for energy production and storage provides many challenges for the field of materials science. Examples include the development of new electrode materials for lightweight rechargeable batteries, proton and oxide-ion conducting ceramics for high temperature fuel cells and novel thermoelectric compounds to convert waste heat into usable electrical power. Its sensitivity to locating light atoms in the presence of heavier ones makes neutron powder diffraction a powerful tool for structural studies of many of these 'energy materials' which, for example, rely on rapid diffusion of ions such as H^+, Li^+ and O^{2-} through the solid. Furthermore, the penetrating power of neutrons allows diffraction studies to be performed on the materials within complex sample environment devices. This presentation will show examples of the use of neutron powder diffraction to characterise the structural properties of materials of relevance to battery, fuel cell and thermoelectric technologies, using in-situ electrochemical devices, high temperature studies performed under controlled reducing and oxidizing conditions and the development of cells which allow simultaneous measurements of relevant bulk properties (e.g. conductivity, Seebeck coefficient) whilst structural studies are performed on the neutron diffractometer.