MATERIALS

BATTERY

NEUTRONS FOR SOCIETY

Performances of Li-ion battery: investigating lithium ions movements

THE PROBLEM to solve: How the lithium ions are exchanged?

Lithium-ion batteries have become the leading technology for powering consumer electronics. However, the required improvement in Lithium-ion batteries efficiency has been slow, and has somewhat held up the development of the electric car. One of the key factors for improving their performance is to understand how the lithium ions are exchanged between the electrode materials during the charge/discharge cycle.

A step towards THE SOLUTION

How the lithium ions are exchanged?
To address this requires being able to 'visualise' the changes in the crystal structure of the electrodes during actual charge/ discharge cycles.
Neutron diffraction is an excellent technique for monitoring lithium ions moving through the electrodes, because neutrons are readily scattered by light elements such as lithium (unlike X-rays).

THE RESULT

Tracking the behaviour of lithium ions and structural modifications in lithium-ion batteries helps designing electrode materials that can sustain high capacity and charge/discharge rate without fading upon cycles.

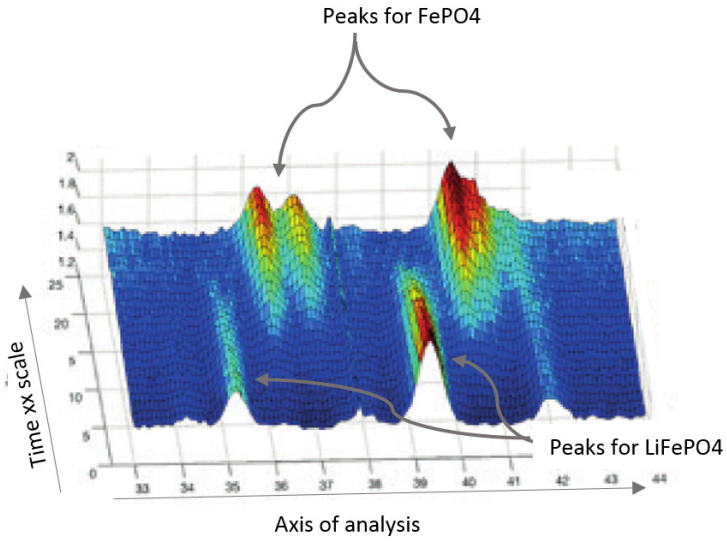

Figure 1

(1) The neutron diffraction results reveal the changes in the real-time working lithium battery electrode: on charging, the initial lithium iron phosphate (LiFePO4) material disappears and is replaced by the iron phosphate (FePO4) charged phase

REFERENCE
M. Bianchini et al., J. Phys. Chem. C, 2014, 118(45), 25947; Neutrons and energy, ILL, 2015

Neutrons for Industry

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SINE2020 Industry Consultancy is now open for requests.

Proof-of-concept experimental beam time is being offered to Industry!

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EXPERT CONSULTANCY

Industrial R&D professionals in collaboration with experienced specialists from European neutron centres.

PARTNERS FROM:

Czech Republic, France, Germany, Hungary, Netherlands, United Kingdom.

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HZB Helmholtz Zentrum Berlin

MLZ Heinz Maier-Leibnitz Zentrum

GEMS German Engineering Materials Science Centre Helmholtz-Zentrum Geesthacht

Orphée Laboratoire Léon Brillouin

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