Hybrid-Kolloquium

Prof. Dr. Harry Hoster
Fakultät für Ingenieurwissenschaften
Lehrstuhl Energietechnik
Universität Duisburg-Essen

The macro and the micro world of batteries and fuel cells

physikalisches Kolloquium

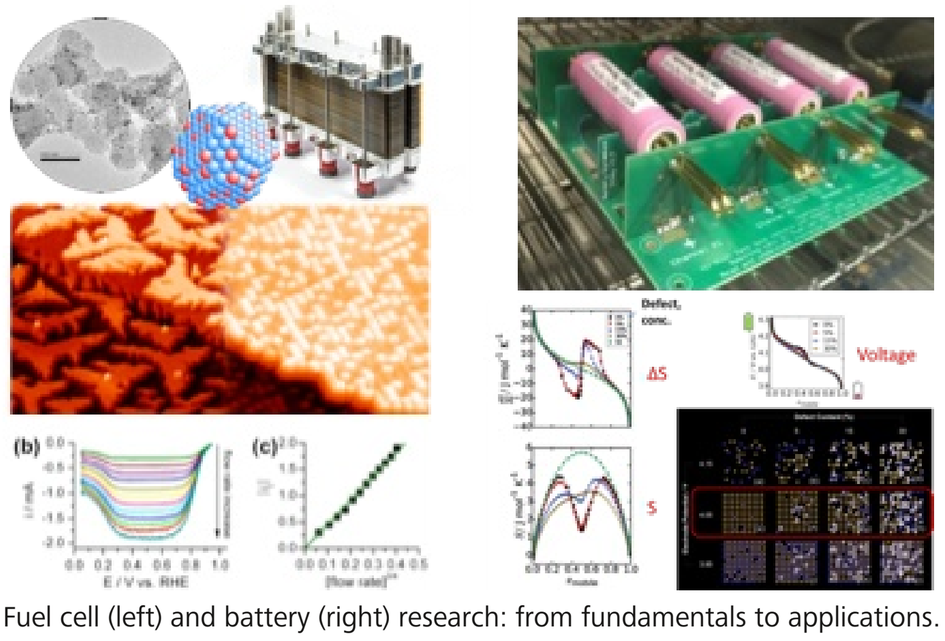
Mo. 17.1.22
17:15 Uhr
Ort: H34
go.ur.de/Koll

Does hydrogen technology end the battery era before it even started? A closer look at the global patterns of energy usage shows why both technologies are needed, and which sectors they are likely to claim. Market shares also depend on supply chains and responsible mining capacities.

In battery, fuel cell, and electrolysis technology, fundamental research down to atomic scale remains important. Aims are better performance, lower demand for scarce metals such as cobalt, platinum, or iridium, and longer lifetime. Longevity depends on an understanding and control of side reactions.

Catalytic enhancement of interface reactions, a key target in fuel cells and electrolyser research, is unwanted in lithium-ion batteries. Such reactions decompose the organic electrolyte. In turn, the dissolution and re-insertion of metal ions, which dominate the workings of lithium-ion batteries, occur as side-processes in fuel cells and electrolysers.

Energy storage research is now a melting pot of solid-state physics, surface physics, statistical thermodynamics, electrochemistry, machine learning, and engineering. The Physics community has yet to provide the most urgently needed research tool: the “fast forward” button of the time counter in degradation research.



Fuel cell (left) and battery (right) research: from fundamentals to applications.