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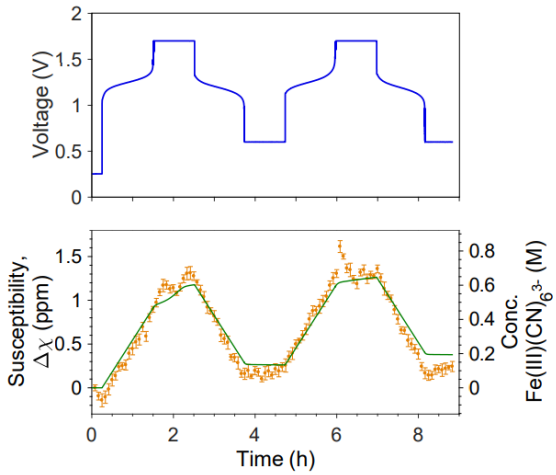
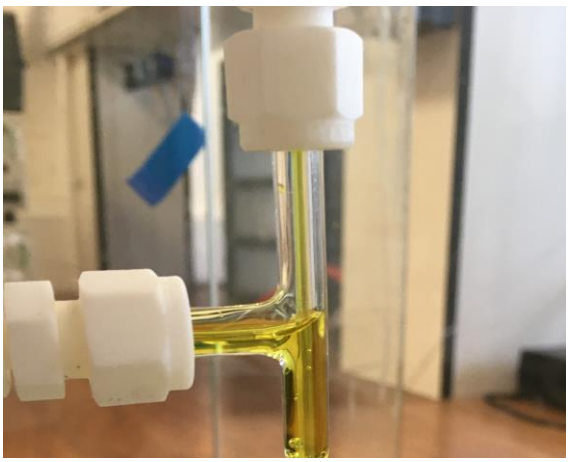
Reliable redox flow battery state-of-charge measurement

A low cost, in line technique to maintain optimal performance

Case Ref: Gre-7712-20





The problem – measuring state-of-charge (SOC) using present techniques is unreliable.
Knowledge of SOC in electrolyte reservoirs in redox flow batteries is essential for electrolyte rebalancing. Without this, optimal performance of these energy storage systems cannot be maintained over long periods, limiting their viability for widespread grid storage.

The solution – inline magnetic susceptibility measurement of redox flow battery electrolyte.

Researchers at the University of Cambridge have applied their extensive expertise in magnetic measurement of electrochemical energy storage devices to create a simple, effective technique for monitoring the SOC of redox flow battery electrolytes during operation. This is achieved by measuring the magnetic susceptibility of the solution as it flows using a simple Evans balance – a reliable but low-cost device that opens the door for installing this powerful technique in production redox flow battery setups. Reliable knowledge of SOC enables redox flow battery operators to maximise device efficiency through electrolyte rebalancing and precisely tuning depth of discharge.

Benefits

- Reliable SOC measurement enables optimal long-term performance
- Simple, low cost, low maintenance
- Applicable to a wide range of redox couples, including those based on vanadium, iron and organic molecules.

Development stage and scope

Excellent measurement performance, with correlation between magnetic susceptibility and SOC, has been demonstrated for iron-based redox flow electrolytes. The technique is equally applicable to other metal-based redox couples such as widely-used vanadium-based electrolytes as well as emerging technologies such as organic electrolytes.

Commercialisation

This process is protected by a patent application (GB 2102339.5) and published as ***Chem. Commun.,*** 2022, **58**, 1342-1345. We are now seeking to work with an industrial partner to help implement this exciting technology in real-world systems.

This technology offers a real competitive advantage through reliable SOC measurement with low additional cost

Professor Clare Grey FRS leads a world-renowned research team focusing on developing and applying advanced analytical techniques to probe the properties of electrochemical energy storage devices.

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