

# Real Space Mapping of Oxygen Vacancy Diffusion and Electrochemical Transformations by Hysteretic Current Reversal Curve Measurements

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## Technology Summary

Electrochemical energy storage and conversion systems based on solid–gas and solid–liquid reactions and local bias-induced transformations are a vital component of future energy and information technologies. Development of high-energy and power-density materials necessitates understanding the nanoscale mechanisms involved in secondary batteries, fuel cell and air-battery operation. These mechanisms include the interplay between interfacial electrochemical reactions, oxygen vacancy diffusion, and structural defects. This ORNL invention offers an approach for probing ion diffusivity and electrochemical reactivity at the nanometer scales of electrochemically active surfaces and packaged devices. The method provides insight into the energy conversion and storage device operation on the level of single structural element.

## Advantage

- Ability to map ionic diffusion and electrochemical reactivity at the nanoscale

## Potential Applications

- Fuel cells
- Secondary and primary batteries
- Metal-air batteries
- Memristive and electroresistive electronics

## Patent

Application in preparation.

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