

Sandia LabNews

Labs Accomplishments 2013

1. Please check the ONE most-appropriate category:

| | | |
|--|---|---|
| <input type="checkbox"/> Nuclear weapons engineering (incl. surety, survivability, etc.) | <input type="checkbox"/> Weapons security (safeguards, transport, incident response, etc.) | <input type="checkbox"/> Product realization (incl. NW design, manufacture, etc.) |
| <input type="checkbox"/> Remote sensing (electronics for global awareness, verification, surveillance, reconnaissance, etc.) | <input type="checkbox"/> Military programs (incl. military systems, missile defense, defense technology products & support, etc.) | <input checked="" type="checkbox"/> Energy (nuclear energy, alternative energy, fossil fuels, water, energy security, etc.) |
| <input type="checkbox"/> Global security (nonproliferation, global threat reduction, international maritime security, etc.) | <input type="checkbox"/> Homeland security (incl. materials detection, event mitigation, force protection, border security, etc.) | <input type="checkbox"/> Infrastructure protection |
| <input type="checkbox"/> Bioscience | <input type="checkbox"/> Computer & information sciences (incl. modeling & simulation, visualization, etc.) | <input type="checkbox"/> Engineering sciences (incl. experimentation, validation, predictive simulation, etc.) |
| <input type="checkbox"/> Materials (nano, materials processing, reliability, etc.) | <input type="checkbox"/> Microelectronics & Microsystems | <input type="checkbox"/> Pulsed Power |
| <input type="checkbox"/> Partnerships & alliances | <input type="checkbox"/> HR, Finance, & Legal | <input type="checkbox"/> ES&H & Security |
| <input type="checkbox"/> IT, networks, & facilities | <input type="checkbox"/> Supply chain | <input type="checkbox"/> Governance, leadership, & management |
| <input type="checkbox"/> Community involvement, customer relations, institutional development | <input type="checkbox"/> Ethics & business conduct | <input type="checkbox"/> Other (specify): Click here to enter text. |

2. SMU: Indicate which SMU(s) this project supports (required): ECIS

3. Description of accomplishment: Be brief (**85 words**) and lively. Remember that this is for a general audience. Emphasize significance and/or potential application, interest to customers, etc. Avoid acronyms. Include center numbers at end of item for all centers that made significant contributions. Accomplishment should have occurred largely during FY11.

[Write here: 85 words or less]

Electrochemical hydrogen oxidation is the basis for a clean, secure energy future, and yet has not been fully understood. Our work breaks through past limitations by chemically characterizing the reaction *in operando* (i.e., while the energy-conversion device is operating). For the first time we directly identify a rate-determining electrochemical reaction intermediate and describe the complete multistep reaction. Surprisingly, the slow step transfers no electrons. This finding challenges conventional wisdom and provides direct insight into how to accelerate the important hydrogen oxidation process.

4. Illustrations: IMPORTANT: If you have a photo, drawing, or chart, please provide it, along with a brief caption. Submit electronically via email in jpg, tif, PhotoShop, or other common image format (**do not submit images embedded in Word or PowerPoint files**; these do not reproduce well). Be sure to label any separate graphics file in such a way that it can be readily associated with the written submission.

[Caption here: Please note filename for graphic]

Reaction pathway for hydrogen oxidation on a doped zirconia (YSZ) electrolyte contacted by a positively biased Pt electrode. Boxed labels indicate the reaction sequence. Red arrows indicate charge-transfer processes. Dotted lines indicate ionic and electronic conduction processes.

5. Classification review: If your content is technical in nature, include name, phone, org. number, and email of the derivative classifier who has reviewed it prior to submission: [Click here to enter text.](#)

6. Submitted by: (include name, phone, org. number, and email):

Farid El Gabaly Marquez

Phone: (925)294-3441

Org 8656

Email: felgaba@sandia.gov

