Postdoctoral Research Associate Position in MEA Electrolyzers and Operando X-ray Absorption Spectroscopy

The Chemistry and Catalysis Division of SSRL (Stanford Synchrotron Radiation Lightsource) Directorate at SLAC National Accelerator Laboratory invites applications for a Postdoctoral Research Associate to advance scalable electrochemical energy conversion. The successful candidate will bridge benchtop electrocatalysis with scalable energy conversion reactions by membrane electrode assembly (MEA) electrolyzer development, which is compatible with advanced operando X-ray absorption spectroscopy (XAS) at SSRL beamlines.

The candidate will lead development of zero-gap MEA electrolyzers for a broad range of conversions, e.g., CO_2/CO electroreduction, nitrate reduction, nitrogen oxidation, oxygen reduction, and water electrolysis. By using these platforms, together with synchrotron XAS, the candidate will conduct accelerated stress testing and failure mode analysis, as well as probe catalytic mechanisms, electrode restructuring, and interfacial chemistry under realistic operating conditions. A distinctive focus is dynamic (pulsed) electrochemical operation and engineering of the catalyst microenvironment to control selectivity, rate, and durability, with mechanistic feedback from operando XAS. This role offers a unique opportunity at the **intersection of MEA-based electrochemical engineering, electrocatalysis, and synchrotron-based operando spectroscopy** at a DOE light source user facility, while engaging multidisciplinary teams across national laboratories and universities.

Key responsibilities

- **MEA electrolyzer development:** Lead the design, fabrication, and operation of zero-gap MEA electrolyzers spanning gas-diffusion-electrode (GDE) and catalyst-coated-membrane (CCM) architectures, balancing performance, selectivity, durability, and compatibility with operando measurements.
- **Electrode & microenvironment engineering:** Formulate catalyst inks; tune ionomer and binder content; develop microenvironment modifiers such as ionic-liquid / supported-ionic-liquid-phase (SILP) coatings; and apply spray-coating, hot-pressing, or related methods to produce uniform, high-performing electrodes.
- **Cell testing & diagnostics:** Build and operate test stations and balance-of-plant for MEA evaluation under steady-state and pulsed-waveform conditions, including polarization curves, electrochemical impedance spectroscopy, accelerated stress tests, and product quantification by gas chromatography, mass spectrometry, NMR, and HPLC.
- **Operando XAS integration & characterization:** Adapt MEA electrolyzers for operando XAS at SSRL beamlines and perform operando XAS to extract mechanistic insight into oxidation-state evolution, local coordination, and active-site dynamics.
- **Scale-up:** Translate single-cell results toward multi-cell stacks and scaled hardware to address electrode uniformity, flow-field design, thermal and water management, and reproducible fabrication. Turn mechanistic findings into design guidance for scaled electrochemical technologies.
- **Dissemination:** Contribute to high-impact publications and presentations at electrochemistry, catalysis, and synchrotron science conferences.

Required qualifications

- Ph.D. in Chemistry, Chemical Engineering, Materials Science, or a related discipline with an emphasis on electrochemistry or electrocatalysis, completed within the last three years (or completion of Ph.D. requirements confirmed prior to the start date).
- Demonstrated hands-on experience designing, fabricating, and operating MEA electrolyzers, including CCM and GDE configurations, as evidenced by publications or comparable research output.

- Working knowledge of MEA components and assembly: catalyst ink formulation, ionomer selection and loading, anion- or cation-exchange membranes, gas-diffusion layers and porous transport layers, flow-field plates, and spray-coating or hot-press fabrication workflows.
- Familiarity with MEA testing protocols and balance-of-plant operation, including polarization and impedance measurements, gas/liquid product quantification, water and gas management, and durability or accelerated stress testing.
- Substantive research background in one or more relevant electrocatalytic conversions (e.g., CO_2/CO reduction, nitrate reduction, nitrogen oxidation, oxygen reduction, or water electrolysis).
- Excellent data-analysis, organizational, written, and verbal communication skills, and the ability to work effectively in a large, multidisciplinary team.

Preferred qualifications

- Experience performing operando or in situ XAS of working electrochemical systems, including data acquisition, reduction, and quantitative analysis.
- Experience with dynamic / pulsed-potential electrochemistry and time-resolved or modulation-excitation spectroscopic methods.
- Experience engineering the catalyst microenvironment (e.g., ionic-liquid / SILP coatings, surface modifiers) to control selectivity and mass transport in gas-fed electrolyzers.
- Experience with stack-level or scaled MEA testing, including multi-cell hardware, flow-field design, and longer-duration durability studies.
- Proficiency with scientific scripting (e.g., Python) for data reduction, analysis, and visualization, and interest in beamline operations or scientific user facilities.

Appointment and application

This is a **fixed-term postdoctoral position**, expected to be a **2-year appointment** with the possibility of extension contingent upon project needs and funding. **Application materials** should include a **cover letter**, a **curriculum vitae**, a **list of publications**, a **statement of research** (including a summary of accomplishments and future research plans), and the **names of three references for future letters of recommendation**.

Please email all application materials to Dr. Dimosthenis Sokaras (dsokaras@slac.stanford.edu) and Dr. Haoyi Li (haoyili@slac.stanford.edu).

SLAC is a U.S. Department of Energy (DOE) laboratory operated by Stanford University and based in Menlo Park, CA. The **Chemistry and Catalysis Division** is part of the SSRL Directorate and works in close partnership with collaborators across the DOE national laboratory and university communities.