Opportunity Title: Solid Oxide Feul Cell Research-PGRP
Opportunity Reference Code: NETL-2019-Hackett-PGRP-1

Organization National Energy Technology Laboratory (NETL)

Reference Code NETL-2019-Hackett-PGRP-1

How to Apply A complete application consists of:

- An application
- Transcripts
- A current resume/CV, including academic history, employment history, relevant experiences, and publication list
- Two educational or professional references

All documents must be in English or include an official English translation.

Please send a CV to Dr. Greg Hackett at gregory.hackett@netl.doe.gov

If you have questions, send an email to NETLadmin@orau.org. Please include the reference code for this opportunity in your email.

Application Deadline 2/15/2019 11:59:00 PM Eastern Time Zone

Description Through the Oak Ridge Institute for Science and Education (ORISE) this posting seeks a post-doctoral researcher to conduct applied research in support of the National Energy Technology Laboratory (NETL). Participant would conduct applied research in support of NETL Solid Oxide Fuel Cells (SOFC) research. Research efforts associated with this position focus primarily on: (1) electrode engineering technology; (2) examination of electrode degradation processes; (3) fundamental reaction and transport measurement. Broadly, the project goals are:

1. Support direct laboratory testing of SOFC for degradation in response to operating conditions using conventional and advanced electrochemistry tools and analysis;
2. Generate test specimen using conventional and advanced techniques cell component manufacturing;
3. Analyze microstructure and composition of fuel cell specimen using conventional and advanced analytical equipment;
4. Design and construct electrochemical testing systems for fundamental electrochemical properties investigation;
5. Complete literature surveys and generate or support generation of review frameworks and research papers;
6. Collaborate in an integrated team research environment

Examples of SOFC research completed by NETL are embodied in the following references:

1. Shiwoo Lee and Kirk Gerdes, “Functional nanostructure engineering of SOFC cathode by solution infiltration,” ECS Electrochem. Lett. 2015 volume 4, issue 3, F17-F20.

2. Harry Abernathy, Harry O. Finklea, David S. Mebane, Xueyan Song, Yun Chen, Kirk Gerdes, "Examination of the mechanism for the reversible aging behavior at open circuit when changing the operating temperature of

(La0.8Sr0.2)0.95MnO3 electrodes", Solid State Ionics, 272, pp. 144-154, 2015.

3. S. Gandavarapu, Katarzyna Sabolsky, Kirk Gerdes, and Edward Sabolsky, “In-situ foaming of porous (La0.6Sr0.4)0.98(Co0.2Fe0.8)O3-d (LSCF) Cathodes for SOFC Applications,” Int’l J of Applied Ceramics (2013) 10.1111/ijac.12142

Qualifications **QUALIFICATIONS**:

The successful candidate will possess demonstrable skill in conducting laboratory experiments and will possess some knowledge of conventional techniques of electrochemical performance testing (e.g. cyclic voltammetry, V-I curve generation, Electrochemical Impedance Spectroscopy, Ionic Conductivity, and Electrical Conductivity Relaxation). The successful candidate will have experience in basic ceramic processing such as powder synthesis, tape casting, screen printing, and sintering. The successful candidate will preferably have experience in wet chemistry methods, and basic understanding of the general principles of fuel cell operation. The successful candidate will have experience in microstructure analysis with SEM, EDS, AFM, etc., and sample preparation for the analyses. The successful candidate will have experience in designing and constructing model experiment setup. The successful candidate will possess excellent communication skills, and will possess demonstrable experience completing research in a collaborative/team environment.

The successful candidate is NOT required to possess specific experience in solid oxide fuel cells, but preference will be given to candidates with experience in solid oxide fuel cells, electro-ceramic materials, electrochemistry, or any related systems in sensors, membranes, and other energy conversion devices.

SPECIFIC TASKS:

The specifically envisioned tasks support the broad goals described above, and may include one or more of the following elements

1. Standardized electrode manufacturing method will be developed by utilizing conventional and advanced ceramic processing methods in conjunction with various team effort to understand electrode reaction and degradation mechanism, and to develop degradation models.
2. Tailored materials and methods for electrode nano-engineering will be developed at a button cell scale (2 cm2) and will also be evaluated at the commercial stack scale (16 cm2 or larger) to ensure proper performance and sufficient potential to continue development. Various type fuel cells will be used, and standard investigations will be completed for air/hydrogen tests operated at 500 to 800ºC and lasting 100 to 500 hours.
3. A series of candidate electrocatalyst materials will be selected for insertion into the cathode or anode microstructure to effect an improvement in cell performance, measured by any of the following

criteria:

- Increased electrode activity.
- Improved electrode stability / reduced intrinsic electrode degradation.
- Enhanced resistance to contaminant exposure / reduced extrinsic electrode degradation.
- Lowered operating temperature for intermediate temperature use
- Decreased cost on the basis of power density

4. Degradation arising from inherent impurities will be examined through long-duration exposure testing coupled with detailed ex-situ spectroscopy and electron microscopy. Samples of standard samples will be subjected to 500-1000 hour operations under the standard cell operating conditions in preparation for ex-situ analysis.

5. Novel electrode and electrocatalyst materials will have their electrochemical properties characterized, as well as the degradation of those properties. The fundamental characterization of these materials will aid in materials selection and inform the long term SOFC degradation models being developed at NETL.

Eligibility Requirements

- **Degree:** Master's Degree or Doctoral Degree.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (12 👁)
  - **Communications and Graphics Design** (2 👁)
  - **Computer, Information, and Data Sciences** (16 👁)
  - **Earth and Geosciences** (21 👁)
  - **Engineering** (27 👁)
  - **Environmental and Marine Sciences** (14 👁)
  - **Life Health and Medical Sciences** (45 👁)
  - **Mathematics and Statistics** (10 👁)
  - **Other Non-Science & Engineering** (2 👁)
  - **Physics** (16 👁)
  - **Science & Engineering-related** (1 👁)
  - **Social and Behavioral Sciences** (27 👁)

Affirmation I certify that I:

- Have an earned or will receive a doctoral or master's degree by appointment start date.

OR

- Have received the degree no more than three years before the date of application (postmasters' applicants).

OR

- Have received the degree no more than five years before the date of application (postdoctoral applicants).