TITLE: Chemist / Chemical Engineer / Materials Scientist / Physicist
DEPARTMENT, AGENCY: Department of Energy, National Energy Technology Laboratory
STIPEND RANGE: Depends on level of experience
OPEN PERIOD: Open until filled
LEVEL: Post-Doctoral Research Associate (preferred), Faculty (preferred),or Graduate Student
POSITION INFORMATION: Temporary Appointment: 1 year period between approximately June 1, 2015 and May 30, 2016; Full-Time (40 hours per week).
WHO MAY BE CONSIDERED: United States Citizens and Foreign Nationals with approval

DESCRIPTION:

An opportunity exists for post-doctoral researchers to conduct applied research in support of NETL Solid Oxide Fuel Cells research. Research efforts associated with this position focus primarily on: (1) electrode infiltration 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 of cathode infiltration;
3) Complete literature surveys and generate or support generation of review frameworks and research papers;
4) Collaborate in an integrated team research environment.

SPECIFIC TASKS:

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

1) Tailored materials and methods for infiltration will be developed at a button cell scale (2 cm2) and will also be evaluated at the test stack scale (16 cm2) to ensure proper performance properly and sufficient potential to continue development. Standard anode supported planar test specimen will be used, and standard investigations will be completed for air/hydrogen tests operated at 750 to 800ºC and lasting 100 to 500 hours.

2) Application of active materials to the SOFC anode is considered to be one method by which microstructural control, improved stability, and enhanced reactivity may be imparted to the whole cell. A series of candidate anode infiltrate materials will be selected for insertion in the anode microstructure to effect an improvement in cell performance, measured by any of the following criteria:
   - Increased anode activity.
   - Improved electrode stability / reduced intrinsic electrode degradation.
   - Enhanced resistance to contaminant exposure / reduced extrinsic electrode degradation.
   - Decreased cost on the basis of power density.

   Selection of a candidate material will be informed on the basis of the method of infiltration, pre-treatment of the anode (whether reduced or not), composition and function of the infiltrate slip, and other relevant materials preparation and processing parameters. At least one candidate material will be identified through a series of repeat tests conducted to assure statistical accuracy of claims (whether affirmative or negative). Performance and stability will be verified on hydrogen and methane-containing fuels by traditional electrochemical testing (V-I curve generation, impedance spectroscopy) and examination using conventional microscopy/ spectroscopy.

3) Degradation arising from inherent impurities will be examined through long-duration exposure

testing coupled with detailed ex-situ spectroscopy. Samples of standard samples will be subjected to 500-1000 hour operations under the standard cell operating conditions in preparation for ex-situ analysis.

4) Comprehensive degradation modes will be considered to ensure that a complete understanding of all anode degradation processes is obtained. Effort will include literature review of reported degradation mechanisms and generation of analytical tools and methodologies.

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

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

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.

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

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 preferably have experience in wet chemistry methods, and basic understanding of the general principles of fuel cell operation. 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, electroceramic materials, electrochemistry, or any related systems in sensors, membranes, and other energy conversion devices.

Interested candidates may contact Dr. Kirk Gerdes (kirk.gerdes@netl.doe.gov) directly with a current CV at the earliest opportunity.

HOW TO APPLY:

Applicants should apply through the Oak Ridge Institute for Science and Education (ORISE) program (orise.orau.gov). NETL utilizes the ORISE program to support research and work within NETL's Office of Research & Development.

• Interested applicants should complete the online application at http://www.orau.gov/netl/
• The online **application list one of the following as your requested mentor** to associate your application with this job posting.

Dr. Kirk Gerdes
Dr. Paul Ohodnicki

If you have additional questions please contact the NETL ORISE program coordinator, Nancy Andres, Nancy.Andres@NETL.DOE.GOV.