Scientist/Engineer Postdoctorate in CO_2 Electro-catalysis

An immediate position for a scientist/engineer to design and develop: 1) electrolyzers and electrochemical reactors for converting gas to liquids/solids using electricity; 2) catalyst synthesis, testing and integration with electrodes and novel counter electrode reactions and semiconductors; 3) chemical mechanism and microkinetic modelling. The individual will join a team of scientists/engineers working on electrocatalyst synthesis, characterization and integration with conductors and semiconductors/photoabsorbers. Preferred backgrounds include instrument design and fabrication, materials science, analytical chemistry and engineering physics. The candidate will collaborator with experts in the field of: 1) ab initio electronic structure methods for elucidation of mechanisms; 2) design and fabrication of electrolyzers for CO_2 conversion. Opportunities are available for exceptional candidates with strong publication records who are highly motivated regardless of their specific area of expertise. Funding for this project is provided by RenewCO_2 through support from the Department of Energy Small Business Innovation Research and National Science Foundation Small Business Technology Transfer Programs. A list of relevant publications and background for this project is attached.

Peer learning through ongoing research projects is available in related topics: electrocatalysis for water splitting (O_2 and H_2 generation), dinitrogen fixation, photoelectrochemistry, electrochemical cell fabrication. The successful applicant will join a group of scientists, engineers and students collaborating across disciplinary boundaries in the Department of Chemistry and Chemical Biology, the Institute for Advanced Materials and Device Nanotechnology, and the Laboratory for Surface Modification. Internal collaborator: the Garfunkel Laboratory; external collaborator: National Renewable Energy Laboratory and RenewCO2. Professional development in areas of sustainable energy is provided through the Rutgers Energy Institute and the Bloustein Center for Energy, Economics and Environmental Policy.

The initial appointment will be for one year. Funding for continuation will be available with mutual agreement. Starting salary: $53-60K based on experience. The position is open until filled. Posted July 1, 2022.

Applications should include a curriculum vita, list of publications and a brief statement (less than 3 pages) of research interests and goals. On the application, please list three references that you have asked to send letters of recommendation. All application materials must be submitted electronically to the following address with this subject line:
YOUR NAME_YOUR FILE NAME_SOLARFUELS PD
RutgerSOLARFUELSPD@chem.rutgers.edu
Reference letters on letterhead may be sent either to the address below (hard copies) or to the above electronic address using the same subject line formatting as above.

Atten: Prof. G. C. Dismukes
Research Associate Position
Department of Chemistry and Chemical Biology
123 Bevier Road

NSF-CLP
NSF-STTR

DOE-BES
DOE-EERE
DOE-SBIR

Rutgers University
Piscataway, NJ 08854

Our Sponsors: *RenewCO$_2$ LLC, NSF STTR and DOE SBIR, DOE-BES*

Publications upon which this project will build:

1. Hwang, S., S.H. Porter, M.J. Li, R. Thorpe, A.B. Laursen, H.F. Gu, A. Safari, M. Greenblatt, E. Garfunkel and G.C. Dismukes, *Creating Functional Oxynitride-Silicon Interfaces and SrNbO2N Thin Films for Photoelectrochemical Applications br.* **Journal of Physical Chemistry C**, 2022. **126**(13): p. 5970-5979.10.1021/acs.jpcc.1c10148
2. Gates, C., G. Ananyev, S. Roy-Chowdhury, B. Cullinane, M. Miller, P. Fromme and G.C. Dismukes, *Why Did Nature Choose Manganese over Cobalt to Make Oxygen Photosynthetically on the Earth?* **The Journal of Physical Chemistry B,** 2022. **126**(17): p. 3257-3268.10.1021/acs.jpcb.2c00749
3. Laursen, A.B., K.U. Calvinho, T.A. Goetjen, K.M. Yap, S. Hwang, H. Yang, E. Garfunkel and G.C. Dismukes, *CO2 electro-reduction on Cu3P: Role of Cu (I) oxidation state and surface facet structure in C1-formate production and H2 selectivity.* **Electrochimica Acta**, 2021. **391**: p. 138889.10.1016/j.electacta.2021.138889
4. Calvinho, K.U.D., A.W. Alherz, K.M.K. Yap, A.B. Laursen, S. Hwang, Z.J.L. Bare, Z. Clifford, C.B. Musgrave and G.C. Dismukes, *Surface Hydrides on Fe2P Electrocatalyst Reduce CO2 at Low Overpotential: Steering Selectivity to Ethylene Glycol.* **J Am Chem Soc,** 2021. **143**(50): p. 21275-21285.10.1021/jacs.1c03428
5. Hwang, S., Young, J.L., Mow, R., Garfunkel, E., Dismukes, G.C., *Highly efficient and durable III-V semiconductor-catalyst photocathodes: Via a transparent protection layer.* **Sustainable Energy and Fuels**, 2020. **4**(3): p. 1437–1442.https://doi.org/10.1039/C9SE01264H
6. Hwang, S., S.H. Porter, A.B. Laursen, H.B. Yang, M.J. Li, V. Manichev, K.U.D. Calvinho, V. Amarasinghe, M. Greenblatt, E. Garfunkel and G.C. Dismukes, *Creating stable interfaces between reactive materials: titanium nitride protects photoabsorber-catalyst interface in water-splitting photocathodes.* **Journal of Materials Chemistry A**, 2019. **7**(5): p. 2400-2411.
7. Calvinho, K.U.D., A.B. Laursen, K.M.K. Yap, T.A. Goetjen, S. Hwang, N. Murali, B. Mejia-Sosa, A. Lubarski, K.M. Teeluck, E. Garfunkel, M. Greenblatt and G.C. Dismukes, *Nickel phosphides catalyze the electrochemical CO2 reduction to C3 and C4 products at low overpotential*. **Energy and Environmental Science**, 2018. **11**(9): p. 2550-2559.
8. Laursen AB, Wexler RB, Whitaker MJ, Izett EJ, Calvinho KUD, Hwang S, Rucker R, Wang H, Li J, Garfunkel E, Greenblatt M, Rappe AM, Dismukes GC (2018) Climbing the Volcano of Electrocatalytic Activity while Avoiding Catalyst Corrosion: Ni_3P, a Hydrogen Evolution Electrocatalyst Stable in Both Acid and Alkali. **ACS Catalysis**, 8(5):4408–4419. https://doi.org/10.1021/acscatal.7b04466.
9. Laursen, A.B,; K. R. Patraju, M. Whitaker, T. Sarkar, N. Yao, K. V. Ramanujachary, M. Greenblatt, G. C. Dismukes, "Nanocrystalline Ni_xP_y: a hydrogen evolution electrocatalyst of exceptional efficiency in both alkaline and acidic media." **Energy & Environmental Science**, 2015, **8**: p. 1027-1034. DOI: 10.1039/C4EE02940B.
10. Porter, S.H., S. Hwang, V. Amarasinghe, E. Taghaddos, V. Manichev, M. Li, G. Gardner, A. Safari, E. Garfunkel, M. Greenblatt and G.C. Dismukes, *Optimizing the "Artificial Leaf" Photoanode-Photocathode-Catalyst Interface Systems for Solar Water Splitting.* **Electrochemical Society Transactions**, 2016. 72 (37), 1-19
11. S Hwang, SH Porter, G Gardner, AB Laursen, H Wang, M Li, M. Greenblatt, E. Garfunkel, GC Dismukes, *Thin Film Catalysts: Ni_5P_4 (Cathodic) and $LiCoO_2$ (Anodic) for Electrolysis of Water*. **Electrochemical Society Transactions**, 2016. 72 (23), 31-51
12. Smith, P.F., B.J. Deibert, S. Kaushik, G. Gardner, S. Hwang, H. Wang, J.F. Al-Sharab, E. Garfunkel, L. Fabris, J. Li and G.C. Dismukes, *Coordination Geometry and Oxidation State Requirements of Corner Sharing MnO_6 Octahedra for Water Oxidation Catalysis: An Investigation of Manganite (γ-MnOOH).* **ACS Catalysis**, 2016. **6**(3): p. 2089–2099.

13. Gardner, G., J. Al-Sharab, N. Danilovic, Y.B. Go, K. Ayer, M. Greenblatt and G.C. Dismukes, *Structural basis for differing electrocatalytic water oxidation by the cubic, layered and spinel forms of lithium cobalt oxides.* **Energy Environ. Sci.**, 2016. **9**: p. 184--192.
14. Clyde W. Cady, Graeme Gardner, Zachary O. Maron, Maria Retuerto, Yong Bok Go, Shreeda Segan, Martha Greenblatt, G. Charles Dismukes "Tuning the Electrocatalytic Water Oxidation Properties of AB_2O_4 Spinel Nanocrystals: A (Li, Mg, Zn) and B (Mn, Co) Site Variants of $LiMn_2O_4$" **ACS Catalysis,** 2015. **5**(6): p. 3403-3410.