Kevin Knehr

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Education

Drexel University — Philadelphia, Pennsylvania
B.S. in Mechanical Engineering — September 2007 - Present
Drexel University Penonni Honors College — **Cumulative GPA: 3.93**

Honors and Awards

- Barry M. Goldwater Scholar, 2011
- Hess Scholars Promising Undergraduate Research Award, Best in Class Poster, Winter 2011
- NSF Research Experience for Undergraduates (REU) Fellowship, Summer 2010 & Summer 2011
- Drexel REU Poster Session – 1st Place Overall, Summer 2010
- Drexel REU White Paper Proposal Competition – Honorable Mention, Summer 2010
- Hess Undergraduate Research Scholarship, 2010 – 2011
- A.J. Drexel Academic Scholarship, Fall 2007 – Present
- Drexel University Dean's List, Fall 2007 – Present

Research Interests

Renewable Energy Systems; Electrochemical Energy Conversion and Storage; Vanadium Redox Flow Batteries; Fuel Cells; Computation Modeling

Research Experience

Electrochemical Energy Systems Laboratory, Drexel University — Philadelphia, PA
Research Co-op — March - September 2011

- Performed a theoretical analysis of the reaction kinetics and transport phenomena that occur in vanadium redox flow batteries
- Worked closely with a Ph.D. student on the development of a performance model regarding the operation of a vanadium redox flow battery
- Mentored a freshman student and assisted PhD students in guiding a NSF-REU student during the summer of 2011

NSF Research Experience for Undergraduates (REU), Drexel University — Philadelphia, PA
Research Fellow, Computing for Power and Energy Program — June - August 2010

- Formulated a mathematical model predicting the performance of a vanadium redox flow battery

Hess Undergraduate Scholars Research, Drexel University — Philadelphia, PA
Electrochemical Energy Systems Laboratory — January 2010 - March 2011

- Independently performed a complete literature review on the redox flow battery
- Developed and published a more complete version of the Nernst equation for predicting the open circuit voltage of a vanadium redox flow battery

- Completed experimental tests which measured the performance of a vanadium redox flow battery with varying operating conditions

Industry Experience

Teledyne Energy Systems Hunt Valley, MD
Advance Power Group Intern/Co-op March – September 2010

- Tracked the performance degradation of various testing units for radioisotope thermoelectric generators (RTG)
- Updated, edited, and designed QuickBasic program codes used to normalize RTG data and predict RTG performance
- Developed and implemented throughout the company a part drawing search program designed with Visual Basic for Applications software that collects, organizes, and opens data from five different data repositories in the company's system. (Includes training the employees)
- Created a model in MATLAB that predicts the performance of a thermoelectric couple

PECO Energy Philadelphia, PA
Reliability Intern March – September 2009

- Assisted engineers in improving the reliability of distribution circuits
- Analyzed and recorded operations of reliability distribution equipment
- Performed an analysis on vegetation related outages on poor performing circuits

Journal Publications

- K.W. Knehr, Ertan Agar, C. R. Dennison, A. R. Kalidindi, and E. C. Kumbur, 2011, "Macroscopic model of a vanadium redox flow battery incorporating the crossover of vanadium ions and negatively charged species through the membrane," *Electrochimica Acta*. (in progress)
- G. Qiu, Abhijit S. Joshi, C. R. Dennison, K.W. Knehr, E. C. Kumbur, and Ying Sun, 2011, "3-D pore-scale resolved model for coupled ion/charge/fluid transport in a vanadium redox battery using x-ray tomography and the lattice boltzmann method," *Electrochimica Acta*. (submitted)
- K. W. Knehr and E. C. Kumbur, 2011, "Open circuit voltage of vanadium redox flow batteries: discrepancy between models and experiments," *Electrochemistry Communications*, vol. 13, pp. 342-345.

Abstracts and Presentations

- C. R. Dennison, K. W. Knehr, Ertan Agar and E. C. Kumbur, 2011, "Component and performance analysis of vanadium redox flow batteries: experimental and modeling studies," *2011 AIChE Annual Meeting*, October 11-16, Minneapolis, MN (Abstract).
- Ertan Agar, K. W. Knehr, C. R. Dennison, and E. C. Kumbur, 2011, "Modeling the effects of crossover on the performance of a vanadium redox flow battery," *Comsol Conference 2011*, October 13-15, Boston, MA (Abstract).
- Ertan Agar, K. W. Knehr, C. R. Dennison, and E. C. Kumbur, 2011, "Investigation of performance limiting issues in vanadium redox flow batteries: a macroscopic modeling approach," *220th ECS Meeting and Electrochemical Summit*, October 9-14, Boston, MA (Abstract + Presentation).
- C. R. Dennison, K. W Knehr, and E. C. Kumbur, 2011, "Characterization of electrode and cell potential in vanadium redox flow batteries," *5th International Conference on Energy Sustainability*, August 7-10, Washington DC (Abstract).

- K. W. Knehr, C. R. Dennison, and E. C. Kumbur, 2011, "Open circuit voltage and electrode transport characteristics in vanadium redox flow batteries," *Drexel University Research Day*, April 8, Philadelphia, PA (Poster + Presentation)
- K. W. Knehr, Ertan Agar, and E. C. Kumbur, 2011, "2-D Modeling of a vanadium redox flow battery," *Hess Research Seminar*, June 26, Philadelphia, PA (Presentation).
- C. R. Dennison, K. W Knehr, and E. C. Kumbur, 2010, "Open circuit voltage and effects of electrode compression in vanadium redox flow batteries," *Third International Forum on Multidisciplinary Education and Research for Energy Science*, December 9-14, Tokyo Institute of Technology COE Program, Japan (Abstract).
- K. W. Knehr and E. C. Kumbur, 2010, "Open circuit voltage of vanadium redox flow batteries," *Hess Research Seminar*, December 6, Philadelphia, PA (Presentation).

Activities and Affiliations

- Pi Tau Sigma, Drexel – Mechanical Engineering Honor Society
- International Association for Hydrogen Energy (IAHE)
- The Electrochemical Society – Student Member

Computer Skills

Matlab, Comsol, Labview, ProE, Microsoft Office Suite, AutoCad, Visual Basic, QuickBasic