Stanford

William Chueh

Director, Precourt Institute for Energy, Kimmelman Professor, Professor of Materials Science and Engineering, of Energy Science and Engineering, of Photon Science and Senior Fellow at the Precourt Institute for Energy

CONTACT INFORMATION

- **Executive Assistant**

  Nancy Sandoval - Executive Assistant

  Email sandoval@stanford.edu

  Tel (650) 725-3230

Bio

BIO

The availability of low-cost but intermittent renewable electricity (e.g., derived from solar and wind) underscores the grand challenge to store and dispatch energy so that it is available when and where it is needed. Redox-active materials promise the efficient transformation between electrical, chemical, and thermal energy, and are at the heart of carbon-neutral energy cycles. Understanding design rules that govern materials chemistry and architecture holds the key towards rationally optimizing technologies such as batteries, fuel cells, electrolyzers, and novel thermodynamic cycles. Electrochemical and chemical reactions involved in these technologies span diverse length and time scales, ranging from Ångströms to meters and from picoseconds to years. As such, establishing a unified, predictive framework has been a major challenge. The central question unifying our research is: “can we understand and engineer redox reactions at the levels of electrons, ions, molecules, particles and devices using a bottom-up approach?” Our approach integrates novel synthesis, fabrication, characterization, modeling and analytics to understand molecular pathways and interfacial structure, and to bridge fundamentals to energy storage and conversion technologies by establishing new design rules.

ACADEMIC APPOINTMENTS

- Professor, Materials Science and Engineering
- Professor, Energy Science & Engineering
- Senior Fellow, Precourt Institute for Energy
- Professor, Photon Science Directorate
- Principal Investigator, Stanford Institute for Materials and Energy Sciences

ADMINISTRATIVE APPOINTMENTS

- Director, Precourt Institute for Energy, Stanford University, (2024- present)
- Faculty Director Energy Innovation and Emerging Technologies Program, Stanford University, (2018- present)

HONORS AND AWARDS

- Outstanding Young Investigator Award, Materials Research Society (2018)
- Science Award Electrochemistry, BASF/Volkswagen (2016)

- Camille Dreyfus Teacher-Scholar Award, Camille Dreyfus Foundation (2016)
- Alfred P. Sloan Research Fellowship in Chemistry, Alfred P. Sloan Foundation (2016)
- CAREER Award, National Science Foundation (2015)
- Young Scientist Award, International Society for Solid State Ionics (2013)
- Top 35 innovators under the age of 35, MIT Technology Review (2012)
- Professor of the Year Teaching Award, Stanford Society of Women Engineers (2013)
- Demetriades-Tsafka-Kokkalis Prize in Energy, Caltech (2011)
- President Harry S. Truman Distinguished Postdoctoral Fellowship, Sandia Naitonal Laboratories (2010)
- Graduate Student Award, American Vacuum Society Thin Film Division (2009)
- Josephine de Karman Fellowship, Josephine De Karman Fellowship Trust (2009)
- Graduate Excellence in Materials Science Diamond Award, American Ceramics Society (2008)

PROFESSIONAL EDUCATION

- PhD, Caltech , Materials Science (2010)
- BS, Caltech , Applied Physics (2005)

LINKS

- The Chueh Group: http://chuehlab.stanford.edu
- Stanford Energy Professional Certificate Program: https://scpd.stanford.edu/public/category/courseCategoryCertificateProfile.do?method=load&certificateId=13886655

Teaching

COURSES

2025-26

- Scaling Sustainability Solutions: SUSTAIN 170A, SUSTAIN 370A (Aut)
- Scaling Sustainability Solutions : Invention, Innovation, and the Prototype-to-Plant Journey: SUSTAIN 170C, SUSTAIN 370C (Spr)
- Scaling Sustainability Solutions: Financing Sustainability Solutions: SUSTAIN 170B, SUSTAIN 370B (Win)

2024-25

- Scaling Sustainability Solutions: SUSTAIN 170, SUSTAIN 370 (Aut)

2023-24

- ESE Master's Graduate Seminar: ENERGY 351 (Spr)
- ESE PhD Graduate Seminar: ENERGY 352 (Spr)
- Energy storage and conversion systems: Solar Cells, Fuel Cells, Batteries: ENERGY 201C (Spr)
- Thermodynamic Evaluation of Green Energy Technologies: MATSCI 144 (Spr)

2022-23

- Thermodynamic Evaluation of Green Energy Technologies: MATSCI 144 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Mayuresh Bhattu, Jacob Florian, Nik Leuenberger

Postdoctoral Faculty Sponsor

Evan Carlson, John Cattermull, Feng-Yang Chen, Ana De La Fuente Duran, Donggun Eum, Kyle Frohna, Hongchang Hao, Shubham Lochab, Leopold Peiseler

Doctoral Dissertation Advisor (AC)

Mircea-Raul Bodrogean, Angel Burgos, Joshua Cheung, Emma Choy, Molly Corr, Isabel Davidoff, Tony Dong, Dylan Edelman, Sebastian Haney, Jason Hwong, Mrinalni Iyer, Nic Liang, Edward Mu, Shripad Malakarjun Patil, Diego Rivera, Alison Shad, Aki Takahashi, Abigail Wucherer

Doctoral Dissertation Co-Advisor (AC)

Levi Hoogendoorn, Samuel Lee, Yuzhe Li, Jessica Luu, Leah Narun, Nayantara Ramakrishnan, Adit Thampi

Doctoral (Program)

Lynne Irvin

Publications

PUBLICATIONS

- **Semiconductor/Mixed Ion & Electron Conductor Heterojunction for Elevated-Temperature Water Splitting.** *Phys. Chem. Chem. Phys.*
  Ye, X., Melas-Kyriazi, J., Feng, Z., A. , Melosh, N., A., Chueh, W., C.
  2013; 15: 15459-15469
- **Determination of the Surface Structure of CeO2(111) by Low-Energy Electron Diffraction.** *J. Chem. Phys.*
  Siegel, D., Chueh, W., C., Gabaly, F., El, McCarty, K., Figurera, J., de la, Blanco-Rey, M.
  2013; 139: 114703
- **Sr- and Mn-doped LaAlO3-δ for Solar Thermochemical H2 and CO Production.** *Energy Environ. Sci.*
  McDaniel, A., H., Miller, E., Arfin, D., Ambrosini, A., Coker, E., O'Hayre, R., Chueh, W. C.
  2013; 6: 2424-2428
- **Identifying Electrochemical Intermediate Species in H2 Redox Reactions on Solid-State Electrolytes.** *Chem. Comm.*
  Gabaly, F., El, McDaniel, A., H., Grass, M., E., Chueh, W., C., Bluhm, H., Liu, Z.
  2012; 48: 8338-8340
- **Ionic and Electronic Conductivity of Nanostructured, Samaria-Doped Ceria.** *J. Electrochem. Soc.*
  Souza, E., C. C., Chueh, W., C., Jung, W., Muccillo, E., N. S., Haile, S., M.
  2012; 159: K127-K135
- **Electrochemistry of Mixed Oxygen Ion & Electron Conducting Electrodes in Solid Electrolyte Cells.** *Annu. Rev. Chem. Biomol. Eng.*
  Chueh, W., C., Haile, S., M.
  2012; 3: 313-341
- **High Stability and Reactivity of Ce3+ on Doped CeO2 Surface Revealed In operando.** *Chem. Mater.*
  Chueh, W., C., McDaniel, A., H., Grass, M., E., Hao, Y., Jaibeen, N., Liu, Z.
  2012; 24: 1876-1882
- **Experimental Determination of Transmittance of Porous Cerium Oxide Media in the Spectral Range 300 – 1,100 nm.** *Exp. Heat Transfer*
  Lang, Z., Chueh, W., C., Ganesan, K., Haile, S., M., Lipinski, W.
  2011; 24: 285-299
- **Decoupling Surface Reaction & Bulk Transport in Mixed Conductors with Electrochemically-Active Surfaces: A 2-D Numerical Study of Ceria.** *Phys. Chem. Chem. Phys.*
  Ciucci, F., Chueh, W., C., Goodwin, D., G., Haile, S., M.
  2011; 13: 2121-2135
- **Reducing Error & Measurement Time in Impedance Spectroscopy Using Model-based Optimal Experimental Design.** *Electrochim. Acta*
  Ciucci, F., Carraro, T., Chueh, W., C., Lai, W.
  2011; 56: 5416-5434

- **Unusual Decrease in Conductivity Upon Hydration in Acceptor Doped, Microcrystalline Ceria.** *Phys. Chem. Chem. Phys.*
  Chueh, W., C., Yang, C. K., Garland, C., M., Lai, W., Haile, S., M.
  2011; 13: 6442-6451
- **High-Flux Solar-Driven Thermochemical Dissociation of CO2 & H2O Using Nonstoichiometric Ceria.** *Science*
  Chueh, W., C., Falter, C., Abbott, M., Scipio, D., Furler, P., Haile, S., M.
  2010; 330: 1797-1801
- **Thermochemical Study of Ceria: Exploiting an Old Material for New Modes of Energy Conversion of CO2 Mitigation.** *Phil. Trans. R. Soc. A.*
  Chueh, W., C., Haile, S., M.
  2010; 368: 3269-3294
- **Ceria as a Thermochemical Reaction Medium for Selectively Generating Syngas or Methane from H2O & CO2.** *Chem. Sus. Chem.*
  Chueh, W., C., Haile, S., M.
  2009; 2: 735-739
- **Electrochemical Studies of Capacitance in Cerium Oxide Thin Films and Its Relationship to Anionic and Electronic Defect Densities.** *Phys. Chem. Chem. Phys.*
  Chueh, W., C., Haile, S., M.
  2009; 11: 8144-8148
- **Electrochemical Behavior of Ceria with Selected Metal Electrodes.** *Solid State Ionics*
  Chueh, W., C., Lai, W., Haile, S., M.
  2008; 179: 1036 - 1041
- **Inverse Opal Ceria-Zirconia: Architectural Engineering for Heterogeneous Catalysis.** *Energy Environ. Sci.*
  Umeda, G., A., Chueh, W., C., Noailles, L., Haile, S., M., Dunn, B., S.
  2008; 1: 484 - 486
- **Tunability of Propane Conversion over Alumina Supported Pt and Rh Catalysts.** *Top. Catal.*
  Chueh, W., C., Shao, Z., Haile., S., M.
  2007; 46: 402 - 413
- **High Power-Density Single-Chamber Fuel Cells Operated on Methane.** *J. Power Sources*
  Shao, Z., Mederos, J., Chueh, W., C., Haile, S., M.
  2006; 162: 589 - 596