

Nicolas GAILLARD, Ph.D.

A. PRESENT POSITION*Assistant Researcher (tenure-track as of August 2017)*

Hawaii Natural Energy Institute, Thin Films Laboratory

University of Hawaii at Manoa

ngaillard@hawaii.edu

B. EDUCATION

- Ph.D. / Micro and Nanoelectronics / Physics Dpt. / Joseph Fourier University, France (2006),
- MS / Micro and Nanoelectronics / Physics Dpt. / Joseph Fourier University, France (2002),
- Engineering Degree / Optoelectronics / National Grad. School of Physics, France (2002),
- BS / Materials Science / Grenoble Institute of Technology, France (2000).

C. PROFESSIONAL EXPERIENCE

2009-present:

Assistant Researcher / University of Hawaii / HNEI

- Head of the Thin Films Laboratory.

- Research and development of thin-film materials, interfaces and devices for renewable energy applications.

2007-2009:

Postdoctoral Fellow / University of Hawaii / HNEI*Supervisor: Dr. Eric L. Miller*

Studied metal oxide thin film materials for photoelectrochemical hydrogen production.

2003-2006:

PhD candidate / Physics dept. / Joseph Fourier University*Supervisor: Pr. Ahmad Bsiesy*

Characterized the morphological, electrical and chemical properties of the metal/insulator interface and their impact on CMOS transistor performances.

2003-2006:

R&D engineer / ST Microelectronics, Inc. / Grenoble, France*Supervisor: Dr. Mickael Gros-Jean*

Developed metal and dielectric thin film materials for commercial DRAM capacitor and CMOS transistor technologies.

2002-2003:

Master's internship / Nippon Telegraph and Telecom (NTT) Basic Research Laboratories, Atsugi, Japan*Supervisor: Dr. Akira Fujiwara*

Characterized quantum effects (Coulomb-blockade oscillations) in single electron transistors.

D. TEACHING AND MENTORING***Class taught at UH Manoa***

- (3) ME435: Experimental Methods in Materials Research (Fall'19),
- (2) ME491-002: Materials for Renewable Energy (Fall'19),
- (1) ME492-001: Materials for Renewable Energy (Fall'18).

Current trainees

- (5) Alexander DeAngelis (Junior Researcher),
- (4) Dr. Wilman Septina (Postdoctoral Fellow),
- (3) Joshua Crunk (ME Masters student),
- (2) Thomas West (ME Undergraduate student),
- (1) Kai Outlaw (ME Masters student).

Past trainees

- (24) Benjamin Thrun (ME Undergraduate student),
- (23) Anne Giovanelli (intern, Auburn University),
- (22) Dr. Kimberly Horsley (Postdoctoral Fellow),
- (21) Julien Leoni (intern, Ecole Superieure d'Ingenieurs de Rennes, France).
- (20) Dr. Marina Chong (Postdoctoral Fellow),
- (19) Dr. Aiping Zeng (Postdoctoral Fellow),
- (18) Dr. Dixit Prasher (Postdoctoral Fellow),
- (17) Dr. Yuangcheng Chang (Postdoctoral Fellow),
- (16) Dr. Dan Esposito (Visiting Scholar, University of Delaware),
- (15) Dr. Artur Braun (Visiting Scholar, EMPA, Swiss),
- (14) Dr. Jess Kaneshiro (EE graduate student),
- (13) Dr. Jeremy Kowalczyk (Physics graduate student),
- (12) Xi Song (EE graduate student),
- (11) Stephen Bauer (EE undergraduate student),
- (10) Jon-Ross Okuda (EE undergraduate student),
- (9) Chun Ka Kwok (EE undergraduate student),
- (8) Bret Ikei (EE undergraduate student),
- (7) Tomoyuki Miura (ME undergraduate student),
- (6) Aleca Borsuk (ME undergraduate student),
- (5) Stewart Mallory (Chemistry undergraduate student),
- (4) Andrew Madey (intern, University of Oregon),
- (3) Sonia Barney (intern, University of Los Andes, Colombia),
- (2) Jennifer Wong (Kapolei high school student),
- (1) Dante Inouye (Kapolei high school student).

E. GRANTS (*: lead PI)

- (9*) *UH Materials Science Consortium for Research and Education*
Amount awarded: \$350,000
Agency: University of Hawaii, strategic investment initiative
Period of performance: 11/2017-03/2020
Role: principal investigator
- (8*) *Novel Chalcopyrites for Advanced Photoelectrochemical Water-Splitting*
Amount awarded: \$1,113,100
Agency: Department of Energy
Period of performance: 10/2017-09/2020
Role: principal investigator
- (7*) *Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting*
Amount awarded: \$3,050,000
Agency: Department of Energy
Period of performance: 10/2014-09/2017
Role: principal investigator
- (6) *Selenide-based Semiconductors as Dual Photoelectrode Approach for Solar Hydrogen*
Amount awarded: \$180,000
Agency: Department of Energy
Period of performance: 10/2014-09/2017
Role: principal investigator for UH task, NREL lead
- (5) *Asia Pacific Research Initiative for Sustainable Energy Systems (APRISES '15)*
Subtask 2.5: Printed Photovoltaics
Amount awarded: \$276,851
Agency: Office of Naval Research
Period of performance: 03/2016-06/2020
Role: task leader
- (4) *Asia Pacific Research Initiative for Sustainable Energy Systems (APRISES '14)*
Subtask 3.3: Materials for Solar Fuels
Amount awarded: \$276,851
Agency: Office of Naval Research
Period of performance: 01/2015-06/2017
Role: task leader

- (3) *Asia Pacific Research Initiative for Sustainable Energy Systems (APRISES '13)*
Subtask 3.3: Solar Fuels Production
Amount awarded: \$293,818
Agency: Office of Naval Research
Period of performance: 01/2014-06/2016
Role: task leader
- (2) *Asia Pacific Research Initiative for Sustainable Energy Systems (APRISES '12)*
Subtask 3.4: Solar Fuels Production
Amount awarded: \$292,587
Agency: Office of Naval Research
Period of performance: 03/2013-09/2015
Role: task leader
- (1) *Asia Pacific Research Initiative for Sustainable Energy Systems (APRISES '11)*
Subtask 3.4: Low Cost Materials for Solar Fuels
Amount awarded: \$292,101
Agency: Office of Naval Research
Period of performance: 03/2012-06/2014
Role: task leader

F. REFEREED JOURNAL ARTICLES (*: lead PI)

- (28*) *Assessing the roles of Cu- and Ag-deficient layers in chalcopyrite-based solar cells through first principles calculations (Editor's Pick)*, A. Sharan, F. P. Sabino, A. Janotti, N. Gaillard, T. Ogitsu and J. B. Varley, *Journal of Applied Physics* **127**, 065303 (2020).
<https://doi.org/10.1063/1.5140736>
- (27*) *Wide-Bandgap Cu(In,Ga)S₂ Photocathodes Integrated on Transparent Conductive F:SnO₂ Substrates for Chalcopyrite-Based Water Splitting Tandem Devices*, N. Gaillard, D. Prasher, M. Chong, A. Deangelis, K. Horsley, H. A. Ishii, J. P. Bradley, J. Varley, and T. Ogitsu, *ACS Appl. Energy Mater.* **2** (8), 5515 (2019).
<https://doi.org/10.1021/acsaem.9b00690>
- (26*) *Molybdenum Disulfide Catalytic Coatings via Atomic Layer Deposition for Solar Hydrogen Production from Copper Gallium Diselenide Photocathodes*, T. R. Hellstern, D. W. Palm, J. Carter, A. D DeAngelis, K. Horsley, L. Weinhardt, W. Yang, M. Blum, N. Gaillard, C. Heske, and T. F Jaramillo, *ACS Appl. Energy Mater.* **2** (2), 1060 (2019).
<https://doi.org/10.1021/acsaem.8b01562>
- (25) *Synthesis of MoS₂ by Treating Molybdenum in H₂S Plasma*, T. R. Hellstern, A. Vesel, R. Zaplotnik and N. Gaillard, *Materiali in Tehnologije* **52** (4), 417-421 (2018).
<https://doi.org/10.17222/mit.2017.147>

- (24*) *Wide Band Gap CuGa(S,Se)₂ Thin Films on Transparent Conductive Fluorinated Tin Oxide Substrates as Photocathode Candidates for Tandem Water Splitting Devices*, A. D. Deangelis, K. Horsley and N. Gaillard, *The Journal of Physical Chemistry C* **122** (26), 14304 (2018). <https://doi.org/10.1021/acs.jpcc.8b02915>
- (23*) *Low-Cost, Efficient and Durable H₂ Production by Photoelectrochemical Water Splitting with CuGa₃Se₅ Photocathodes*, C. Muzzillo, W. Ellis Klein, Z. Li, A. Deangelis, K. Horsley, K. Zhu and N. Gaillard, *ACS Appl. Mater. Interfaces* **10** (23), 19573 (2018). <https://doi.org/10.1021/acsami.8b01447>
- (22*) *Assessing the role of hydrogen in Fermi-level pinning in chalcopyrite and kesterite solar absorbers from first-principles calculations (Editor's Pick)*, J.B. Varley, V. Lordi, T. Ogitsu, A. Deangelis, K. Horsley and N. Gaillard, *Journal of Applied Physics* **123**, 161408 (2018). <https://doi.org/10.1063/1.5006272>
- (21) *Antimony(III) Sulfide Thin Films as a Photoanode Material in Photocatalytic Water Splitting*, A. D. DeAngelis, K. C. Kemp, N. Gaillard and K. S. Kim, *ACS Appl. Mater. Interfaces* **8** (13), 8445 (2016). <https://doi.org/10.1021/acsami.5b12178>
- (20) *Temperature-resistant high-infrared transmittance indium molybdenum oxide thin films as an intermediate window layer for multi-junction photovoltaics*, A. D. DeAngelis, A. Rougier, J.-P. Manaud, C. Labrugère, E. L. Miller and N. Gaillard, *Solar Energy Materials & Solar Cells* **127**, 174 (2014). <https://doi.org/10.1016/j.solmat.2014.04.029>
- (19) *Predicting a new photocatalyst and its electronic properties by density functional theory*, P. Sarker, D. Prasher, N. Gaillard and M. N. Huda, *J. Appl. Phys.* **114**, 133508 (2013). <https://doi.org/10.1063/1.4821429>
- (18) *A Nanocomposite Photoelectrode Made of 2.2 eV Band Gap Copper Tungstate (CuWO₄) and Multi-Wall Carbon Nanotubes for Solar-Assisted Water Splitting*, N. Gaillard, Y. Chang, A. D. DeAngelis, S. Higgins and A. Braun, *Int. Journal of Hydrogen Energy* **38**, 3166 (2013). <https://doi.org/10.1016/j.ijhydene.2012.12.104>
- (17) *Between Photocatalysis and Photosynthesis: Synchrotron spectroscopy methods on molecules and materials for solar hydrogen generation*, D. K. Bora, Y. Hu, S. Thiess, S. Erat, X. Feng, S. Mukherjee, G. Fortunato, N. Gaillard, R. Toth, K. Gajda-Schranz, W. Drube, M. Grätzel, J. Guo, J. Zhu, E. C. Constable, D. D. Sarma, H. Wang and A. Braun, *Journal of Electron Spectroscopy and Related Phenomena* **190**, Part A, 93 (2013). <https://doi.org/10.1016/j.elspec.2012.11.009>
- (16) *Soft x-ray and electron spectroscopy to determine the electronic structure of materials for photoelectrochemical hydrogen production*, L. Weinhardt, M. Blum, O. Fuchs, S. Pookpanratana, K. George, B. Cole, B. Marsen, N. Gaillard, E. L. Miller, K-S. Ahn, S. Shet, Y. Yan, M. M. Al-Jassim, J. D. Denlinger, W. Yang, M. Bär and C. Heske, *Journal of Electron Spectroscopy and Related Phenomena* **190**, Part A, 106 (2013). <https://doi.org/10.1016/j.elspec.2012.11.015>
- (15) *Photoelectrochemical Reforming of Glucose for Hydrogen Production using a WO₃-based Tandem Cell Device*, D. V. Esposito, R. V. Forest, Y. Chang, and N. Gaillard, S. Hou, K. H. Lee, B. E. McCandless, R. W. Birkmire and J. Chen, *Energy Environ. Sci.* **5**, 9091 (2012). [10.1039/C2EE22560C](https://doi.org/10.1039/C2EE22560C)

- (14) *Effect of thermal treatment on the crystallographic, surface energetics and photoelectrochemical properties of reactively co-sputtered copper tungstate (CuWO₄) for water splitting*, Y. Chang, A. Braun, A. D. DeAngelis, J. Kaneshiro and N. Gaillard, J. Phys. Chem. C **115**, 25490 (2011). <https://doi.org/10.1021/jp207341v>
- (13) *Hydrogen production from photo-driven electrolysis of biomass-derived oxygenates: A case study on methanol using Pt-modified WO₃ thin film electrodes*, D. V. Esposito, J. G. Chen, R. W. Birkmire, Y. Chang and N. Gaillard, Int. J. Hydrogen Energ. **36**, 9632 (2011). <https://doi.org/10.1016/j.ijhydene.2011.05.028>
- (12) *Improved current collection in WO₃:Mo/WO₃ bilayer photoelectrodes*, N. Gaillard, B. Cole, B. Marsen, J. Kaneshiro, E. L. Miller, L. Weinhardt, M. Bär, C. Heske, K. -S. Ahn, Y. Yan and M. M. Al-Jassim, J. Mater. Res. **25**, 45 (2010). <https://doi.org/10.1557/JMR.2010.0019>
- (11) *Progress in new semiconductor materials classes for solar photoelectrolysis*, E. L. Miller, N. Gaillard, J. Kaneshiro, A. D. DeAngelis and R. Garland, Int. J. Energy Research **34** (14), 1215 (2010). <https://doi.org/10.1002/er.1660>
- (10) *Advances in Copper-chalcopyrite Thin Films for Solar Energy Conversion*, J. Kaneshiro, N. Gaillard, R. Rocheleau and E. L. Miller, Sol. Energy Mater. Sol. Cells **94**, 12 (2010). <https://doi.org/10.1016/j.solmat.2009.03.032>
- (9) *Accelerating materials development for photoelectrochemical hydrogen production: Standards for methods, definitions, and reporting protocols*, Z. Chen, T. F. Jaramillo, T. G. Deutsch, A. Kleiman-Shwarsstein, A. J. Forman, N. Gaillard, R. Garland, K. Takanebe, C. Heske, M. Sunkara, E. W. McFarland, K. Domen, E. L. Miller, J. A. Turner and H. N. Dinh, J. Mater. Res. **25**, 3 (2010). <https://doi.org/10.1557/JMR.2010.0020>
- (8) *Mo incorporation in WO₃ thin film photoanodes: Tailoring the electronic structure for photoelectrochemical hydrogen production*, M. Bär, L. Weinhardt, B. Marsen, B. Cole, N. Gaillard, E. L. Miller and C. Heske, Appl. Phys. Lett. **96**, 032107 (2010). <https://doi.org/10.1063/1.3291689>
- (7) *Amorphous Silicon Carbide Photoelectrode For Hydrogen Production Directly From Water Using Sunlight*, F. Zhu, J. Hu, I. Matulionis, T. Deutsch, N. Gaillard, A. Kunrath, E. L. Miller and A. Madan, Philosophic Magazine **89**, 2723 (2009). <https://doi.org/10.1080/14786430902740729>
- (6) *Method to assess the grain crystallographic orientation with a submicronic spatial resolution using Kelvin probe force microscope*, N. Gaillard, D. Mariolle, F. Bertin, M. Gros-Jean and A. Bsiesy, Appl. Phys. Lett. **89**, 154101 (2006). <https://doi.org/10.1063/1.2359297>
- (5) *In situ electric field simulation in metal/insulator/metal capacitors*, N. Gaillard, L. Pinzelli, M. Gros-Jean and A. Bsiesy, Appl. Phys. Lett. **89**, 133506 (2006). <https://doi.org/10.1063/1.2357891>
- (4) *Characterization of electrical and crystallographic properties of metal layers at decanometer scale using Kelvin probe force microscope*, N. Gaillard, D. Mariolle, F. Bertin, M. Gros-Jean, A. Bsiesy, A. Bajolet, S. Chhun and M. Djebbouri, Microelec. Eng. **83**, 2169 (2006). <https://doi.org/10.1016/j.mee.2006.09.028>

- (3) *Impact of TiN post-treatment on metal insulator metal capacitor performances*, A. Bajolet, J.P. Manceau, S. Bruyere, R. Clerc, M. Proust, N. Gaillard, J.C. Giraudin, P. Delpéch, L. Montes and G. Ghibaudo, *Microelec. Eng.* **83**, 2189 (2006).
<https://doi.org/10.1016/j.mee.2006.10.004>
- (2) *Integration of a high density Ta₂O₅ MIM capacitor following 3D damascene architecture compatible with copper interconnects*, M. Thomas, A. Farcy, N. Gaillard, C. Perrot, M. Gros-Jean, I. Matko, M. Cordeau, W. Saikaly, M. Proust, P. Caubet, E. Deloffre, S. Crémer, S. Bruyere, B. Chenevier and J. Torres, *Microelec. Eng.* **83**, 2163 (2006).
<https://doi.org/10.1016/j.mee.2006.09.027>
- (1) *Cu surface treatment influence on Si adsorption properties of CuSiN self-aligned barriers for sub-65nm technology node*, S. Chhun, L.G. Gosset, J. Michelon, V. Girault, J. Vitiello, M. Hopstaken, S. Courtas, C. Debauche, P.H.L. Bancken, N. Gaillard, G. Bryce, M. Juhel, L. Pinzelli, J. Guillan, R. Gras, B. Van Schravendijk, J-C Dupuy and J. Torres, *Microelec. Eng.* **83**, 2094 (2006). [10.1016/j.mee.2006.09.013](https://doi.org/10.1016/j.mee.2006.09.013)

G. CONFERENCE PROCEEDINGS

- (8) *Development of Chalcogenide Thin Film Materials for Photoelectrochemical Hydrogen Production*, N. Gaillard, D. Prasher, J. Kaneshiro, S. Mallory and M. Chong, *Materials Research Society Proceedings* **1558**, mrss13-1558-z02-07 (2013).
<https://doi.org/10.1557/opl.2013.1084>
- (7) *Development of metal tungstate alloys for photoelectrochemical water splitting*, D. Prasher, M. Chong, Y. Chang, P. Sarker, M. N. Huda and N. Gaillard, *Proc. SPIE 8822, Solar Hydrogen and Nanotechnology VIII*, 88220E (2013). <https://doi.org/10.1117/12.2026464>
- (6) *Copper Tungstate (CuWO₄)-Based Materials for Photoelectrochemical Hydrogen Production*, N. Gaillard, Y. Chang, A. Braun and A. D. DeAngelis, *Materials Research Society Proceedings* **1446**, mrss12-1446-u02-08 (2012).
<https://doi.org/10.1557/opl.2012.952>
- (5) *I-III-VI₂ (Copper Chalcopyrite-based) Thin Films for Photoelectrochemical Water-Splitting Tandem-Hybrid Photocathode*, J. M. Kaneshiro, A. DeAngelis, X. Song, N. Gaillard and E. L. Miller, *Materials Research Society Proceedings* **1324**, mrss11-1324-d15-08 (2011). <https://doi.org/10.1557/opl.2011.964>
- (4) *Status of Research on WO₃-based Photoelectrochemical Devices at the University of Hawai'i*, N. Gaillard, *Proc. SPIE 7770, Solar Hydrogen and Nanotechnology V*, 77700V (2010). [10.1117/12.860970](https://doi.org/10.1117/12.860970)
- (3) *Surface Modification of Tungsten Oxide-Based Photoanodes for Solar-Powered Hydrogen Production*, N. Gaillard, J. Kaneshiro, E. L. Miller, L. Weinhardt, M. Bär, C. Heske, K.-S. Ahn, Y. Yan and M. Al-Jassim, *Materials Research Society Proceedings* **1171**, 1171-S02-01 (2009). <https://doi.org/10.1557/PROC-1171-S02-01>
- (2) *Development of a hybrid photoelectrochemical (PEC) device with amorphous silicon carbide as the photoelectrode for water splitting*, J. Hu, F. Zhu, I. Matulionis, T. Deutsch, N. Gaillard, E. L. Miller and A. Madan, *Materials Research Society Proceedings* **1171**, 1171-S03-05 (2009). <https://doi.org/10.1557/PROC-1171-S03-05>

- (1) *Metal Electrodes Work Function Measurement at Deca-Nanometer Scale Using Kelvin Probe Force Microscope: A Step Forward to the Comprehension of Deposition Techniques Impact on Devices Electrical Properties*, N. Gaillard, F. Bertin, A. Bsiesy, M. Gros-Jean and D. Mariolle, *Materials Research Society Proceedings* **917**, 0917-E12-04 (2006).
<https://doi.org/10.1557/PROC-0917-E12-04>

H. TECHNICAL REPORTS AND WHITE PAPERS (*: lead PI)

- (7*) *UH Materials Science Consortium for Research and Education*, N. Gaillard, H. Ishii, M. Dubarry, J. Brown, S. Shin, P. Dera, K. Sattler, C. Jensen, M. Ghasemi-Nejhad, M. Manghnani, A. Kim, W. Lee, G. Severa, Y. Zuo and J. Bradley, Final report to the UH Vice Chancellor for Research, [Link to document](#) (2019).
- (6*) *Wide Band Gap Chalcopyrite Photoelectrodes for Direct Water Splitting*, N. Gaillard, Final report to the U.S. Department of Energy, [DE-EE0006670](#) (2019).
- (5) *Photoelectrochemical Hydrogen Production*, J. Hu and N. Gaillard, Final report to the U.S. Department of Energy, [EG36-07GO17105](#) (2013).
- (4) *The Viability of Using Tungsten Oxide Based Compounds as a Photoelectrode for the Solar Production of Hydrogen*, N. Gaillard, Y. Li and H. Wang, U.S. Department of Energy Photoelectrochemical Working Group, [White Papers on Materials for Photoelectrochemical Water Splitting](#) (2013).
- (3) *Engineered Ternary and Quaternary Oxide Minerals with Optimal Absorption Characteristics for Solar-Assisted Low-Cost Hydrogen Production*, N. Gaillard and M. N. Huda, U.S. Department of Energy Photoelectrochemical Working Group, [White Papers on Materials for Photoelectrochemical Water Splitting](#) (2013).
- (2) *I-III-VI₂ Copper Chalcopyrites for Photoelectrochemical Water Splitting* J. Kaneshiro, T. Deutsch, N. Gaillard, Z. Chen, A. Kleiman-Shwarscstein, F. Zhu, M. Weir, U.S. Department of Energy Photoelectrochemical Working Group, [White Papers on Materials for Photoelectrochemical Water Splitting](#) (2013).
- (1) *The Viability of Using Amorphous Silicon Carbide (*a*-SiC) as a Photoelectrode for PEC Hydrogen Production*, J. Hu, F. Zhu, I. Matulionis, J. Gallon, N. Gaillard and T. Deutsch, U.S. Department of Energy Photoelectrochemical Working Group, [White Papers on Materials for Photoelectrochemical Water Splitting](#) (2013).

I. BOOK CHAPTERS AND EDITORIAL WORK

- (3) *Focus Issue: Advanced Materials and Structures for Solar Fuels*, A. Braun, N. Gaillard, E. Miller and H. Wang (Eds.), *Journal of Materials Research* **31** (11) (2016).
<https://doi.org/10.1557/jmr.2016.222>
- (2) *Photoelectrochemical Water Splitting Using Photovoltaic Materials*, N. Gaillard and A. D. DeAngelis, Book chapter in “Solar to Chemical Energy Conversion”, M. Sugiyama, K. Fujii and S. Nakamura (Eds.), *Lecture Notes in Energy*, Springer (2016).
https://doi.org/10.1007/978-3-319-25400-5_16

- (1) *Photoelectrochemical Water Splitting: Standards, Experimental Methods and Protocols*, Z. Chen, T. Deutsch, H. Dinh, K. Domen, K. Emery, A. Forman, N. Gaillard, R. Garland, C. Heske, T. F. Jaramillo, A. Kleiman, E. L. Miller, K. Takane and J. Turner, SpringerBriefs in Energy, ISBN: 978-1-4614-8297-0 (2013). [10.1007/978-1-4614-8298-7](https://doi.org/10.1007/978-1-4614-8298-7)

J. MEETINGS ORGANIZATION

- (4) [Recent Trends and Advances in Artificial Photosynthesis](#), The International Chemical Congress of Pacific Basin Societies 2020, Honolulu (HI), 2020.
- (3) [Symposium I05: Renewable Fuels via Artificial Photosynthesis 3](#), the 233rd Electrochemical Society Meeting, Seattle (WA), 2018.
- (2) [Symposium I03: Renewable Fuels via Artificial Photosynthesis 2](#), the 231st Electrochemical Society Meeting, New Orleans (LA), 2017.
- (1) [Symposium EE2: Advancements in Solar Fuels Generation](#), the Materials Research Society Spring Meeting, Phoenix (AZ), 2016.

K. PRESENTATIONS

INVITED TALKS (*: lead PI)

- (11*) *Emerging Chalcopyrite Photo-absorbers for Renewable Hydrogen Production*, N. Gaillard, the 236th Electrochemical Society Meeting, Symposium I04, [1909](#), Atlanta (GA), 2019.
- (10*) *Wide Bandgap Chalcopyrite-based Photoelectrodes for Renewable Hydrogen Production*, N. Gaillard, The 2019 Spring Meeting of the European Materials Research Society (EMRS), Symposium A “Latest Advances in Solar Fuels III”, [A.5.6](#), Nice (France), 2019.
- (9*) *Wide Bandgap Chalcopyrites for Photoelectrochemical Water Splitting*, N. Gaillard, the Materials Research Society Spring Meeting, Symposium ES11, [ES11.05.03](#), Phoenix (AZ), 2019.
- (8*) *Wide Bandgap Copper Chalcopyrite Candidates for Renewable Hydrogen Generation*, N. Gaillard, A. D. DeAngelis and K. Horsley, the 233rd Electrochemical Society Meeting, Symposium I05, [1884](#), Seattle (WA), 2018.
- (7*) *Novel Chalcopyrite Materials for Economical Photoelectrochemical Hydrogen Production*, N. Gaillard, A. D. DeAngelis and K. Horsley, the 231st Electrochemical Society Meeting, Symposium I03, [1532](#), New Orleans (LA), 2017.
- (6*) *Development of Wide Bandgap Copper Chalcopyrite Materials for Economical Photoelectrochemical Hydrogen Production*, N. Gaillard, A. D. DeAngelis and K. Horsley, the 230th Electrochemical Society Meeting, Symposium L04, [3630](#), Honolulu (HI), 2016.
- (5*) *Wide Bandgap Copper Indium Gallium Disulfide Thin Film Materials for Photoelectrochemical Hydrogen Production*, N. Gaillard, A. DeAngelis, M. Chong and D. Prasher, the 228th Electrochemical Society Meeting, Symposium L06, [1702](#), Phoenix (AZ), 2015.

- (4*) *Wide Bandgap Copper Chalcopyrite Materials for Photoelectrochemical Hydrogen Production*, N. Gaillard, the 226th Electrochemical Society Meeting, Symposium L04, [574](#), Cancun (Mexico), 2014.
- (3) *High Bandgap Copper Indium Gallium Disulfide Materials For Solar-Assisted Water Splitting*, N. Gaillard, D. Prasher, J. Kaneshiro and M. Chong, J. Hu, M. Weir, and C. Heske, the 224th Electrochemical Society Meeting, Symposium I03, [2548](#), San Francisco (CA), 2013.
- (2) *Performance and Limits of 2.2 eV Copper Tungstate (CuWO₄) Mineral for Photoelectrochemical Hydrogen Production*, N. Gaillard, the 222nd Electrochemical Society Meeting, Symposium B10, [1741](#), Honolulu (HI), 2012.
- (1) *Status of Research on Tungsten Oxide-based Photoelectrochemical Devices at the University of Hawaii*, N. Gaillard, SPIE Solar Energy and Technology, [77700V](#), San Diego (CA), 2010.

CONTRIBUTED TALKS (*: lead PI)

- (30*) *Emerging Wide Bandgap Chalcopyrites and Integration Methods for Efficient Multijunction Solar Devices*, N. Gaillard, A. Deangelis, W. Septina and J. Crunk, the Virtual Chalcogenide PV Conference (organized by Helmholtz Center Berlin as a replacement of Symposium A "Thin film chalcogenide photovoltaic materials", initially scheduled for the 2020 Spring Meeting of the European Materials Research Society), Session 01 – Tandems, [0915](#), 2020.
- (29*) *First-Principles Simulations of Stability, Optical and Electronic Properties of Competing Phases in Chalcopyrite-Based Photoelectrodes*, J. Varley, A. Sharan, P. Sabino, A. Janotti, T. Ogitsu and N. Gaillard, the Materials Research Society Fall Meeting, Symposium EL04, [EL04.10.07](#), Boston (MA), 2019.
- (28*) *Atomic Layer Deposited Tungsten-Based Coatings for Durable Solar Hydrogen Production*, D. Palm, C. Muzzillo, N. Gaillard and T. Jaramillo, the 236th Electrochemical Society Meeting, Symposium I04, [1899](#), Atlanta (GA), 2019.
- (27*) *First-Principles Simulations of Stability, Optical and Electronic Properties of Competing Phases in Chalcopyrite-Based Photoelectrodes*, J. Varley, A. Sharan, T. Ogitsu, A. Janotti, A. Deangelis and N. Gaillard, the 235th Electrochemical Society Meeting, Symposium I03, [1627](#), Dallas (TX), 2019.
- (26*) *Cu(In,Ga)S₂ Photocathodes with Optical Bandgap Over 1.7 eV for Photoelectrochemical Water Splitting*, K. Horlsey, A. Deangelis and N. Gaillard, the Materials Research Society Spring Meeting, Symposium EN18, [EN18.15.05](#), Phoenix (AZ), 2018.
- (25*) *Integrating Ab-Initio Simulations and Experimental Characterization Methods: Towards Accelerated Chalcopyrite Materials Development for Hydrogen Production*, T. Ogitsu, J. Varley, A. Deangelis, K. Horsley and N. Gaillard, the 233rd Electrochemical Society Meeting, Symposium I05, [1855](#), Seattle (WA), 2018.

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- (23*) *Photoelectrochemical and Solid-State Properties of Wide Bandgap Copper Chalcopyrites for Renewable Hydrogen Generation*, N. Gaillard, K. Horlsey and A. Deangelis, the Materials Research Society Spring Meeting, Symposium ES7, [ES7.16.02](#), Phoenix (AZ), 2017.
- (22*) *Soft X-ray Spectroscopic Investigation of the CdS/Cu(In,Ga)S₂ Interface in Thin Films for Photoelectrochemical Water Splitting*, J. Carter, B. Elizan, M. Blum, K. Horsley, A. DeAngelis, W. Yang, L. Weinhardt, N. Gaillard and C. Heske, the Materials Research Society Spring Meeting, Symposium ES7, [ES7.4.04](#), Phoenix (AZ), 2017.
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- (19*) *Non-Precious Metal-Catalyzed Photoelectrodes for Hydrogen Production Via Solar Water Splitting*, T. R. Hellstern, A. D. DeAngelis, L. A. King, P. Chakthranont, R. J. Britto, N. Gaillard and T. F. Jaramillo, the 230th Electrochemical Society Meeting, Symposium L04, [3718](#), Honolulu (HI), 2016.
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- (17*) *Identifying Optimal Chalcopyrite Alloys for Photoelectrochemical Hydrogen Production through First-Principles*, J. B. Varley, F. Zhou, V. Lordi, T. Ogitsu, and N. Gaillard, the Materials Research Society Spring Meeting, Symposium EE2, [EE2.4.01](#), Phoenix (AZ), 2016.
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- (15*) *Efficient Solar-to-Hydrogen Production Materials and Devices*, H. Wang, J. Ager, N. Gaillard, and E. L. Miller, the 228th Electrochemical Society Meeting, Symposium L06, [1693](#), Phoenix (AZ), 2015.
- (14*) *Development of Wide Bandgap Copper Chalcopyrite Thin Film Materials for Photoelectrochemical Hydrogen Production*, N. Gaillard, A. D. DeAngelis, M. Chong and A. Zeng, the Materials Research Society Spring Meeting, Symposium J, [J2-04](#), San Francisco (CA), 2015.
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- (12) *Development of metal tungstate alloys for photoelectrochemical water splitting*, D. Prasher, M. Chong, Y. Chang, P. Sarker, M. N. Huda and N. Gaillard, Solar Energy and Technology, Solar Hydrogen and Nanotechnology VIII, [88220E](#), San Diego (CA), 2013.
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- (10) *Theory-Driven Metal Oxide Down-Selection for Photoelectrochemical Hydrogen Production: the Case of Metal Tungstates*, N. Gaillard, Y. Chang, D. Prasher, P. Sarker and M. N. Huda, the Materials Research Society Spring Meeting, symposium D, [D10-02](#), San Francisco (CA), 2013.
- (9) *Surface Modification of a-SiC Photoelectrode Using Metal Nanoparticles*, F. Zhu, I. Matulionis, N. Gaillard, Y. Chang, J. Hu, J. Gallon and A. Madan, the Materials Research Society Spring Meeting, Symposium D, [D10-09](#), San Francisco (CA), 2013.
- (8) *Analysis of Functional and Dysfunctional Defects in Photoelectrode Materials for Solar Water Splitting*, A. Braun, N. Gaillard, Y. Chang, D. K Bora, K. Gajda-Schranz, J. Guo, Z. Liu, K. Sivula, M. Grätzel and E. Constable, the 222nd Electrochemical Society Meeting, Symposium B10, [1709](#), Honolulu (HI), 2012.
- (7) *Hybrid Photovoltaic/Photoelectrochemical Device Design Using I-III-VI₂ Copper Chalcopyrite-Based Photocathodes*, J. M. Kaneshiro, Y. Chang and N. Gaillard, the 222nd Electrochemical Society meeting, Symposium B10, [1710](#), Honolulu (HI), 2012.
- (6) *Copper Tungstate (CuWO₄)-Based Materials for Photoelectrochemical Hydrogen Production*, N. Gaillard, Y. Chang, A. Braun and A. D. DeAngelis, the Materials Research Society Spring Meeting, Symposium U, [U02-08](#), San Francisco (CA), 2012.
- (5) *I-III-VI₂ (Copper Chalcopyrite-based) Thin Films for a Photoelectrochemical Water-splitting Tandem-hybrid Photocathode*, J. Kaneshiro, A. Deangelis, N. Gaillard and Eric Miller, Material Research Society Spring Meeting, [D15-08](#) (2011).
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- (3) *Surface Modification of Tungsten Oxide-Based Photoanodes for Solar-Powered Hydrogen*, N. Gaillard, J. Kaneshiro, E. L. Miller, L. Weinhardt, M. Bär, C. Heske, K. -S. Ahn, Y. Yan and M. M. Al-Jassim, the Materials Research Society Spring Meeting, Symposium S, [S02-01](#), San Francisco (CA), 2009.
- (2) *Characterization of Electrical and Crystallographic Properties of Metal Layers at Deca-Nanometer Scale using Kelvin Probe Force Microscopy*, N. Gaillard, D. Mariolle, F. Bertin, M. Gros-Jean, A. Bsiesy, A. Bajolet and S Chhun, Materials for Advanced Metallization Conference, Grenoble (France), 2006.
- (1) *Metal Electrodes Work Function Measurement at Deca-Nanometer Scale using Kelvin Probe Force Microscope: a Step Forward to the Comprehension of Deposition Techniques Impact on Devices Electrical Properties*, N. Gaillard, D. Mariolle, F. Bertin, M. Gros-Jean and A. Bsiesy, the Materials Research Society Spring Meeting, [E12-04](#), San Francisco (CA), 2006.

POSTER PRESENTATIONS (*: lead PI)

- (14*) *Wide-Bandgap CuGa(S,Se)₂ As Top Cell Photocathodes for Tandem Water Splitting Devices*, A. Deangelis, K. Horsley and N. Gaillard, the Materials Research Society Spring Meeting, Symposium EN19, [EN19.04.34](#), Phoenix (AZ), 2018.
- (13*) *Monolithic Tandem Devices using Wide-bandgap Chalcopyrite Absorbers for Photoelectrochemical Water Splitting*, K. Horsley, A. DeAngelis, T. Hellstern, T. Jaramillo and N. Gaillard, Materials Research Society Spring Meeting, Symposium [ES14.9.32](#), Phoenix (AZ), 2017.
- (12*) *Soft X-ray Spectroscopy of the CdS/Cu(In,Ga)S₂ Interface for Photoelectrochemical Water Splitting*, J. Carter, M. Blum, K. Horsley, A. DeAngelis, W. Yang, D. Hauschild, L. Weinhardt, N. Gaillard, and C. Heske, [Gerischer Electrochemistry Today Symposium](#), Boulder (CO), 2018.
- (11*) *Atomic layer deposited coatings for durable (photo)electrochemical hydrogen evolution*, D. W. Palm, T. R. Hellstern, J. Carter, A. DeAngelis, K. Horsley, M. Blum, L. Weinhardt, W. Yang, N. Gaillard, C. Heske, and T. F. Jaramillo, [Gerischer Electrochemistry Today Symposium](#), Boulder (CO), 2018.
- (10*) *Engineering Interfaces for the Activation and Stabilization of Photovoltaic-Grade Thin Film Light Absorbers for Photoelectrochemical Hydrogen Production*, D. W. Palm, T. R. Hellstern, N. Gaillard and T. F. Jaramillo, The American Institute of Chemical Engineers Annual Meeting, [617EY](#), San Francisco (CA), 2016.
- (9*) *Activation and stabilization of copper chalcopyrite light absorbers for photoelectrochemical hydrogen production*, D. W. Palm, T. R. Hellstern, N. Gaillard and T. F. Jaramillo, American Chemical Society National Meeting, [ENEL206](#), San Francisco (CA), 2017.
- (8*) *Engineering Interfaces for Enhanced Carrier Extraction, Stability, and Catalysis in Copper Chalcopyrite Photoelectrochemical Arrays*, D. W. Palm, T. R. Hellstern, N. Gaillard and T. F. Jaramillo, the Materials Research Society Fall Meeting, [ES02.09.29](#), Boston (MA), 2017.
- (7) *Ruthenium-Based Materials for Oxygen and Hydrogen Evolution Catalysis in Photoelectrochemical Applications*, Y. Chang, J. M. Kaneshiro and N. Gaillard, The Electrochemical Society PRIME meeting, [1775](#), Honolulu (HI), 2012.
- (6) *I-III-VI₂ (Copper Chalcopyrite-based) Thin Films for Photoelectrochemical Water-Splitting Tandem-Hybrid Photocathode*, J. M Kaneshiro, A. Deangelis, X. Song, N. Gaillard and E. L. Miller, Material Research Society Spring Meeting, Symposium D, [D15-08](#), San Francisco (CA), 2011.
- (5) *Copper-silver chalcopyrites as top cell absorbers in tandem photovoltaic and hybrid photovoltaic/photoelectrochemical devices*, J. M Kaneshiro, A. Deangelis, N. Gaillard, Y. Chang, J. Kowalczyk and E. Miller, Photovoltaic Specialists Conference, [5614163](#), Honolulu (HI), 2010.

- (4) *Low-temperature indium molybdenum oxide as a window layer in CIGS photovoltaic devices*, A. DeAngelis, J. Kaneshiro, N. Gaillard, Y. Chang, J. Kowalczyk, S. A. Mallory and E. Miller, Photovoltaic Specialists Conference, [5614632](#), Honolulu (HI), 2010.
- (3) *Measurement of the sodium concentration in CIGS solar cells via laser induced breakdown spectroscopy*, J. M. D. Kowalczyk, J. Perkins, J. Kaneshiro, N. Gaillard, Y. Chang, A. DeAngelis, S. A. Mallory, D. Bates and E. Miller, Photovoltaic Specialists Conference, [5615854](#), Honolulu (HI), 2010.
- (2) *Bulk and Surface Engineering of Tungsten Oxide-Based Photoanodes for Solar-Powered Water Splitting*, N. Gaillard, J. Kaneshiro, M. Al-Jassim, C. Heske and E. Miller, ECS Prime conference, [458](#), Honolulu, (HI), 2008.
- (1) *Substrate Crystallographic Effect on TiN Work Function*, N. Gaillard, D. Mariolle, F. Bertin, M. Gros-Jean and A. Bsiesy, 36th IEEE Semiconductor Interface Specialist Conference, Arlington (VA), 2005.

PROGRAM REVIEWS (*: lead PI)

- (10*) *Novel Chalcopyrites For Advanced PEC Water Splitting*, N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD162](#), Crystal City (VA), 2019.
- (9*) *Novel Chalcopyrites For Advanced PEC Water Splitting*, N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD162](#), Washington DC, 2018.
- (8*) *Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting*, N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD116](#), Washington DC, 2018.
- (7*) *Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting*, N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD116](#), Washington DC, 2017.
- (6*) *Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting*, N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD116](#), Washington DC, 2016.
- (5*) *Wide Bandgap Chalcopyrite Photoelectrodes for Direct Solar Water Splitting*, N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD116](#), Arlington (VA), 2015.
- (4) *Photoelectrochemical Hydrogen Production*, J. Hu and N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD053](#), Arlington (VA), 2013.
- (3) *Photoelectrochemical Hydrogen Production*, J. Hu and N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD053](#), Arlington (VA), 2012.

- (2) *Photoelectrochemical Hydrogen Production*, J. Hu and N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD053](#), Arlington (VA), 2011.
- (1) *Photoelectrochemical Hydrogen Production*, J. Hu and N. Gaillard, DOE Hydrogen & Fuel Cells Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting, [PD053](#), Washington DC, 2010.

THESES

- (2) *Etude des Propriétés Morphologiques, Electriques et Chimiques de l'Interface Métal/Isolant et de leur Impact sur les Performances de la Capacité TiN/Ta₂O₅/TiN*, N. Gaillard, Matière Condensée[cond-mat]. Université Joseph-Fourier - Grenoble I, Ph.D. Thesis, 2006. (French), [tel-00142484](#).
- (1) *Quantum Effects in Single Electron Transistors*, N. Gaillard, Université Joseph-Fourier - Grenoble I and Nippon Telegraph and Telecom, Master Thesis, 2003 (French), <https://doi.org/10.6084/m9.figshare.11631888.v1>