

**JOHN MARK P. MARTIREZ, Ph. D.**

D318 Engineering Quadrangle  
Department of Mechanical and Aerospace Engineering  
Princeton University,  
Princeton, New Jersey 08544, USA  
email: **MARTIREZ@princeton.edu**  
phone: 215-667-9426

professional website:  
**<https://martirez.github.io>**

---

**Professional Appointments**

- |                |  |
|----------------|--|
| 2015 – current | <b>Postdoctoral Research Associate</b><br><i>Advisor: Prof. Emily A. Carter</i><br>Department of Mechanical and Aerospace Engineering<br><b>Princeton University</b> , Princeton, New Jersey, United States                |
| 2006 – 2008    | <b>University Instructor</b><br>Institute of Chemistry, University of the Philippines - Diliman<br>Diliman, Quezon City, Metro Manila, Philippines<br><i>Full-time laboratory instructor in undergraduate laboratories</i> |

---

**Education**

- |             |  |
|-------------|--|
| 2015        | <b>Ph.D. in Chemistry</b><br><i>Advisor: Prof. Andrew M. Rappe</i><br><b>University of Pennsylvania</b> ,<br>Philadelphia, Pennsylvania, United States |
| 2006 – 2008 | Graduate Chemistry studies ( <i>coursework</i> ),<br>University of the Philippines - Diliman<br>Diliman, Quezon City, Metro Manila, Philippines        |
| 2006        | <b>B.S. in Chemistry, <i>Magna cum Laude</i></b><br>University of the Philippines - Diliman<br>Diliman, Quezon City, Metro Manila, Philippines         |

---

**Patent**

1. J. M. P. Martirez, S. Kim, and A. M. Rappe, Synergistic Oxygen Evolving Activity of Non-Stoichiometric Surfaces. ***United States Letters Patent No.: 9,469,908***. Issued October 18, 2016

---

**Publications** (\* shared first authorship)

14. J. M. P. Martirez, and E. A. Carter, Prediction of a Low-Temperature N<sub>2</sub> Dissociation Catalyst Exploiting Near IR-to-Visible Light Nanoplasmonics. *to be submitted* (2017)
13. L. D. Chen, M. Bajdich, J. M. P. Martirez, C. M. Krauter, J. A. Gauthier, E. A. Carter, A. C. Luntz, K. Chan, and J. K. Nørskov, The Charge of an Ion in the Outer Helmholtz Plane. *to be submitted* (2017)

12. R. B. Wexler, J. M. P. Martirez, and A. M. Rappe, Active Role of Phosphorus in the Hydrogen Evolving Activity of Nickel Phosphide (0001) Surfaces. *submitted* (2017)
11. J. M. P. Martirez, and E. A. Carter, Excited-State N<sub>2</sub> Dissociation Pathway on Fe-Functionalized Au. *J. Am. Chem. Soc.*, **139**, 4390-4398 (2017) DOI: 10.1021/jacs.6b12301
10. D. F. Swearer, H. Zhao, L. Zhou, C. Zhang, H. Robatjazi, J. M. P. Martirez, C. M. Krauter, S. Yazdi, M. J. McClain, E. Ringe, E. A. Carter, P. Nordlander, N. J. Halas, Heterometallic Antenna-Reactor Complexes for Photocatalysis. *Proc. Natl. Acad. Sci.* **113**, 8916-8920 (2016) DOI: 10.1073/pnas.1609769113
9. R. B. Wexler, J. M. P. Martirez, and A. M. Rappe, Stable Phosphorus Enriched (0001) Surfaces of Nickel Phosphides. *Chem. Mater.* **28**, 5365-5372 (2016) DOI: 10.1021/acs.chemmater.6b01437
8. J. M. P. Martirez, and E. A. Carter, Thermodynamic Constraints in Using AuM (M= Fe, Co, Ni and Mo) Alloys as N<sub>2</sub> Dissociation Catalysts: Functionalizing a Plasmon-Active Metal. *ACS Nano* **10**, 2940-2949 (2016) DOI: 10.1021/acsnano.6b00085
7. Y. Qi, J. M. P. Martirez, W. A. Saidi, J.J. Urban, W.S. Yun, J.E. Spanier and A. M. Rappe, Modified Schottky emission to explain thickness dependence and slow depolarization in BaTiO<sub>3</sub> nanowires. *Phys. Rev. B* **91**, 245431 (2015) DOI: 10.1103/PhysRevB.91.245431
6. J. M. P. Martirez, S. Kim, E. H. Morales, B. T. Diroll, M. Cargnello, T. R. Gordon, C. B. Murray, D. A. Bonnell, and A. M. Rappe, Synergistic Oxygen Evolving Activity of a TiO<sub>2</sub>-rich Reconstructed SrTiO<sub>3</sub>(001) Surface. *J. Am. Chem. Soc.* **137**, 2939-2947 (2015) DOI: 10.1021/ja511332y
5. C. Baeumer, D. Saldana-Greco, J. M. P. Martirez, A. M. Rappe, M. Shim, and L. W. Martin, Ferroelectrically Driven Spatial Carrier Density Modulation in Graphene. *Nat. Commun.* **6**:6136 (2015) DOI: 10.1038/ncomms7136
4. W. A. Saidi\*, J. M. P. Martirez\*, and A. M. Rappe, Strong Reciprocal Interaction between Polarization and Surface Stoichiometry in Ferroelectric Oxides. *Nano Lett.* **14**, 6711-6717 (2014) DOI: 10.1021/nl5035013
3. N. Koocher, J. M. P. Martirez, and A. M. Rappe, Theoretical Model of Oxidative Adsorption of Water on a Highly Reduced Reconstructed Oxide Surface. *J. Phys. Chem. Lett.* **5**, 3408-3414 (2014) DOI: 10.1021/jz501635f
2. E. H. Morales\*, J. M. P. Martirez\*, W. A. Saidi, A. M. Rappe, and D. A. Bonnell, Coexisting Surface Phases and Coherent One-Dimensional Interfaces on BaTiO<sub>3</sub>(001). *ACS Nano* **8**, 4465-4473 (2014) DOI: 10.1021/nn501759g
1. J. M. P. Martirez, E. H. Morales, W. A. Saidi, D. A. Bonnell, and A. M. Rappe, Atomic and Electronic Structure of the BaTiO<sub>3</sub> (001) ( $\sqrt{5} \times \sqrt{5}$ ) R26.6° Surface Reconstruction. *Phys. Rev. Lett.* **109**, 256802 (1-5) (2012) DOI: 10.1103/PhysRevLett.109.256802

## Talks and Presentations

---

### Talks

10. “Plasmon-induced excited-state heterogeneous catalysis on surface-doped metallic nanoparticles” **253rd American Chemical Society National Meeting and Exposition**, San Francisco, California, USA (April 2017)
9. **Invited:** “Modeling Surface Phenomena via First-Principles Quantum Mechanics” **Center for Functional Nanomaterials, Brookhaven National Laboratory**, Upton, New York, USA (January 19, 2017)

8. **Invited:** "Excited-State Heterogeneous Catalysis on Metallic Nanoparticles" **2016 MRS Fall Meeting and Exhibit**, Boston, Massachusetts, USA (November 28 – December 2, 2016)
7. "Excited State Dissociation Pathway for N<sub>2</sub> on Fe-substituted Plasmon-Active Au" **AFOSR MURI Meeting**, Rice University, Houston, Texas, USA (May 2016)
6. **Invited:** "Role of charge-transfer excitations in Au-Fe alloys for heterogeneous N<sub>2</sub> dissociation catalysis" **251st American Chemical Society National Meeting and Exposition** (Computers in Chemistry), San Diego, California, USA (March 13-17, 2016)
5. "Dual active-site catalyst based on a single element for synergistic water-splitting", **9<sup>th</sup> International Workshop on Oxide Surfaces (IWOX- IX)**, Granlibakken Conference Center, Tahoe City, California, USA (January 2014) *on behalf of Prof. Andrew M. Rappe*
4. "Thermodynamic and Kinetic Exploration of Surface Phase Coexistence on an Oxide Surface", **9<sup>th</sup> International Workshop on Oxide Surfaces (IWOX- IX)**, Granlibakken Conference Center, Tahoe City, California, USA (January 2014)
3. "Polarization Dependent Reconstructions of Ferroelectric Surfaces", **APS March Meeting**, Boston, Massachusetts, USA (March 1, 2012)
2. "Hydration phase diagram for BaO terminated BaTiO<sub>3</sub>", **APS March Meeting**, Dallas, Texas, USA (March 22, 2011)
1. "Theoretical study on the diffusion of hydroxyl radical on BaO terminated BaTiO<sub>3</sub>(001) surface", **APS March Meeting**, Portland, Oregon, USA (March 18, 2010)

#### Posters

8. "Modeling Local Excited States on Surface Reactive Sites: An Exploration of Plasmon-Catalyzed CH<sub>4</sub> Dehydrogenation on Ru-functionalized Cu and N<sub>2</sub> Dissociation on Fe-functionalized Au" *AFOSR MURI Review Meeting*, Rice University, Houston, Texas, USA (December 7, 2016)
7. "Surface Functionalization of Plasmon-Active Au for Sustainable Ammonia Synthesis" *Andlinger Center Building Opening Celebration and Symposium*, Princeton University, Princeton, New Jersey, USA (May 2016)
6. "TiO-rich reconstructions of BaTiO<sub>3</sub>(001) surface: The thermodynamics and kinetics of surface defect agglomeration leading to phase coexistence." *Dynamics, Interactions, and Electronic Transitions at Surfaces (DIET14 workshop)*, Pacific Grove, California, USA (October 2014)
5. "Synergistic Oxygen Evolving Activity of a Dual Active-site Catalysts Based on a Single Element", *Gordon Conference - Dynamics at Surfaces*, Salve-Regina University, Rhode Island, USA (August 2013)
4. "Strong Reciprocal Interaction between Polarization and Surface Stoichiometry in Ferroelectric Oxides", *International Workshop on Interfaces at Bear Creek*, Bear Creek Mountain Resort and Conference Center, Pennsylvania, USA (October 2012)
3. "Connection between relaxation of metastable polarization and time evolution of surface ion coverage in BaTiO<sub>3</sub> nanowires", *2011 Workshop on the Fundamental Physics of Ferroelectrics and Related Materials*, Gaithersburg, Maryland, USA (January 2011)
2. "First principle investigation of hydrogen transfer between surface adsorbed H<sub>2</sub>O and OH on BaO (001) surface of thin film BaTiO<sub>3</sub>", *ACS National meeting*, Boston, Massachusetts, USA (August 2010)
1. "First principles investigation of surface dynamics involving OH on thin-film BaTiO<sub>3</sub> surfaces", *22nd Annual Workshop on Electronic Structure Methods*, Austin, Texas, USA (June 2010)

06/06/2017

## References

---

**Prof. Emily A. Carter**

Dean of the School of Engineering and Applied Science  
Professor of Mechanical and Aerospace Engineering  
Princeton University, Princeton, NJ USA  
eac@princeton.edu  
609-258-5391

**Prof. Andrew M. Rappe**

Professor of Chemistry  
Professor of Materials Science and Engineering  
University of Pennsylvania, Philadelphia, PA USA  
rappe@sas.upenn.edu  
215-898-8313

**Prof. Wissam A. Saidi**

Professor of Mechanical Engineering and Materials Science  
University of Pittsburgh, Pittsburgh, PA USA  
alsaidi@pitt.edu  
412-624-4709