

# DIPNA A. PATEL

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**Current Position:** Postdoctoral Researcher, Drexel University, Philadelphia, PA

## EDUCATION

**Tufts University, Medford, MA**

September 2015 – November 2020

Ph.D. in Chemistry

- Dissertation: "Atomic-Scale Insights into the Surface Structure and Reactivity of Model Catalytic Surfaces: Towards the Design of Sustainable Catalysts"
- Advisor: Prof. E. Charles H. Sykes

**College of the Holy Cross, Worcester, MA**

September 2011 – May 2015

B.A. in Chemistry, ACS Accreditation

- Senior Thesis: "Stability of Alkanethiol Self-Assembled Monolayers on Nanoporous Gold"
- Advisor: Prof. Elizabeth Landis

## RESEARCH EXPERIENCE

**Postdoctoral Researcher, Advisor Prof. Yury Gogotsi**

December 2020 – Present

*Department of Materials Science and Engineering, Drexel University, Philadelphia, PA*

- Investigate the surface properties of MXenes under controlled preparation conditions using non-contact atomic force microscopy and Kelvin probe microscopy under ultrahigh vacuum

**Doctoral Research Assistant**

September 2015 – November 2020

*Department of Chemistry, Tufts University, Medford, MA*

- Designed and investigated the surface structure and reactivity of model Cu- and Ag-based alloys using STM, STS, TPD, and RAIRS under ultrahigh vacuum to study ensemble effects of dopant atoms towards hydrogenation and dehydrogenation reactions
- Fostered multidisciplinary collaboration to study the reactivity of dilute bimetallic alloys as a member of Harvard University's Energy Frontier Research Center resulting in multiple collaborative publications
- Mentored 2 undergraduate and 2 junior graduate students in developing experimental design and data analysis methods
- Managed and oversaw lab purchasing and inventory

**Undergraduate Research Assistant**

June 2013 – May 2015

*Department of Chemistry, College of the Holy Cross, Worcester, MA*

- Synthesized nanoporous gold films via modification of established procedures to investigate the binding and stability of thiol self-assembled monolayers on NPG through spectroscopic (FTIR) and electrochemical techniques (CV)
- Developed a novel method for achieving reproducible electrical contacts to the nanoporous gold films to conduct cyclic voltammetry measurements

**Intellectual Property Analytical Forensic Laboratory Intern**

June – August 2014

*Pfizer Inc., Groton, CT*

- Developed a microwave digestion and ICP-MS method for heavy metals testing in counterfeit tablet and ChapStick samples
- Performed HPLC testing on counterfeit tablets to aid Pfizer Global Security in their counterfeit drug case investigations by matching unknown peaks to references using literature sources

## LEADERSHIP

**In collaboration with Harvard University**

Fall 2018 – Fall 2019

***Project Lead in Integrated Mesoscale Architectures for Sustainable Catalysis Center (IMASC)***

- Monitored and guided project development for selective hydrogenation of unsaturated aldehydes through experimental methods and theory by organizing collaborative meetings across 11 participating institutions

**BAPS Youth Activities**  
**Northeast Regional Team Lead**

September 2017 – Present

- Analyze 30 local youth activities reports to inform and guide development of nationally implemented projects aimed to pass on the organization's cultural and moral values

**BAPS Women's Conference**  
**Invited Speaker, Topic: Strength in Unity**

March 2018

**PUBLICATIONS**

10. Mathilde Luneau\*, Jin Soo Lim\*, **Dipna A. Patel\***, E. Charles H. Sykes, Cynthia M. Friend, Philippe Sautet, "Guidelines to Achieving High Selectivity for the Hydrogenation of  $\alpha,\beta$ -Unsaturated Aldehydes with Bimetallic and Dilute Alloy Catalysts – A Review" *Chemical Reviews* **2020** [Accepted]
9. Christopher R. O'Connor, Kaining Duanmu, **Dipna A. Patel**, Eri Muramoto, Matthijs A. van Spronsen, Dario Stacchiola, E. Charles H. Sykes, Robert J. Madix, Cynthia M. Friend, Philippe Sautet, "Facilitating Hydrogen Atom Migration via a Dense Phase on Palladium Islands to a Surrounding Silver Surface" *PNAS* **2020**, *117*, 22657-22664.
8. **Dipna A. Patel**, Robert B. Chevalier, Andrew M. Weller, Christopher C. Shakespeare, Edward J. Soares, Elizabeth C. Landis "Porosity Effects on the Ordering and Stability of Self-Assembled Monolayers on Nanoporous Gold" *Journal of Physical Chemistry C* **2020** [Accepted]
7. Alex C. Schilling, Andrew T. Therrien, Ryan T. Hannagan, Matthew D. Marcinkowski, Paul L. Kress, **Dipna A. Patel**, Tedros A. Balema, Felicia R. Lucci, Benjamin R. Coughlin, Renqin Zhang, Theodore Thuening, Volkan Çınar, Jean-Sabin McEwen, Andrew J. Gellman, and E. Charles H. Sykes, "Templated Growth Homochiral Thin Film Oxide" *ACS Nano* **2020**, *14*, 4682-4688.
6. **Dipna A. Patel**, Ryan T. Hannagan, Paul L. Kress, Alex C. Schilling, Volkan Çınar, and E. Charles H. Sykes, "Atomic-Scale Surface Structure and CO Tolerance of NiCu Single-Atom Alloys" *Journal of Physical Chemistry C* **2019**, *123*, 28142-28147.
5. **Dipna A. Patel**, Paul L. Kress, Laura A. Cramer, Amanda M. Larson, and E. Charles H. Sykes, "Elucidating the Composition of PtAg Surface Alloys with Atomic-Scale Imaging and Spectroscopy" *Journal of Chemical Physics* **2019**, *151*, 164705. [Editor's Pick]
4. Ryan T. Hannagan, **Dipna A. Patel**, Laura A. Cramer, Alex C. Schilling, Paul T. P. Ryan, Amanda M. Larson, Volkan Çınar, Yicheng Wang, Tedros A. Balema, and E. Charles H. Sykes, "Combining STM, RAIRS, and TPD to Decipher the Dispersion and Interactions Between Active Sites in RhCu Single-Atom Alloys" *ChemCatChem* **2019**, *12*, 488-493.
3. Tedros A. Balema, Nisa Ulumuddin, Colin J. Murphy, Diana P. Slough, Zachary C. Smith, Ryan T. Hannagan, Natalie A. Wasio, Amanda M. Larson, **Dipna A. Patel**, Kyle Groden, Jean-Sabin McEwen, Yu-Shan Lin, and E. Charles H. Sykes, "Controlling Molecular Switching via Chemical Functionality: Ethyl vs Methoxy Rotors" *Journal of Physical Chemistry C* **2019**, *123*, 23738-23746.
2. Natalie A. Wasio, Colin J. Murphy, **Dipna A. Patel**, Daniel Wei, David S. Sholl, and E. Charles H. Sykes, "Towards Directional the Directional Transport of Molecules on Surfaces" *Tetrahedron* **2017**, *73*, 4858-4863.
1. **Dipna A. Patel**, Andrew M. Weller, Robert B. Chevalier, Constantine A. Karos, and Elizabeth C. Landis "Ordering and Defects in Self-Assembled Monolayers on Nanoporous Gold" *Applied Surface Science*, **2016**, *387*, 503-512.

## **PRESENTATIONS**

10. Department of Energy, Yellow Team Presentation, January 27<sup>th</sup>, 2020  
**Invited Talk:** “Elucidating the Elucidating the Composition of PtAg Surface Alloys with Atomic-Scale Imaging and Spectroscopy”
9. American Vacuum Society 66<sup>th</sup> International Symposium and Exhibition (AVS) – San Diego, CA, October 20<sup>th</sup> – 25<sup>th</sup>, 2019  
Oral Presentation: “Surface Reactivity of PtAg and PdAg: From Single-Atom Alloys to Supported Nanoparticles”  
Poster: “Surface Reactivity of PtAg and PdAg: From Single-Atom Alloys to Supported Nanoparticles”
8. College of the Holy Cross Seminar – Worcester, MA, September 27<sup>th</sup>, 2019  
**Invited Talk:** “Designing Heterogeneous Single-Atom Alloy Catalysts from First Principles and Surface Science”
7. American Chemical Society – San Diego, CA, August 25<sup>th</sup> – 29<sup>th</sup>, 2019  
Oral Presentation: “Atomic-Scale Characterization and Reactivity of PtAg Surface Alloys”
6. American Vacuum Society 65<sup>th</sup> International Symposium and Exhibition (AVS) – Long Beach, CA, October 21<sup>st</sup> – 26<sup>th</sup>, 2018  
Oral Presentation: “Surface Structure and Reactivity of NiCu Single-Atom Alloys”
5. American Chemical Society – Boston, MA, August 19<sup>th</sup> – 23<sup>rd</sup>, 2018  
Oral Presentation: “Surface Structure and Reactivity of NiCu Single-Atom Alloys”
4. American Vacuum Society 64<sup>th</sup> International Symposium and Exhibition (AVS) – Tampa, FL, October 29<sup>th</sup> - November 3<sup>rd</sup>, 2017  
Oral Presentation: “Surface Structure and Reactivity of NiCu Surface Alloys”
3. New England Energy Research Forum at Worcester Polytechnic Institute – Worcester, MA, June 28<sup>th</sup>, 2017  
Oral Presentation “Atomic-Scale Characterization of PtAg Surface Alloys”
2. American Chemical Society – Dallas, TX, March 16<sup>th</sup> - 20<sup>th</sup>, 2014  
Poster: “Investigation of Thiol and Amine Self-Assembled Monolayers on Nanoporous Gold”
1. 20<sup>th</sup> Annual Undergraduate Research Symposium – College of the Holy Cross, Worcester, MA, September 6<sup>th</sup>, 2013  
Poster: “Investigating the Stability of Thiol Self-Assembled Monolayers on Nanoporous Gold”

## **AWARDS**

- Outstanding Academic Excellence Award Finalist at Tufts University May 2020
- Russell and Sigurd Varian National Award at AVS 66 October 2019
- Best Young Scientist Presentation Award at AVS 64 October 2017
- ACS Student Award for Outstanding Achievement in Analytical Chemistry April 2015

## **TEACHING EXPERIENCE**

### **Tufts University: Department of Chemistry, Medford, MA**

General Chemistry I Laboratory, Teaching Assistant Fall 2015 & Summer 2018  
General Chemistry II Laboratory, Teaching Assistant Spring 2016

### **College of the Holy Cross: Department of Chemistry, Worcester, MA**

Quantum Mechanics & Spectroscopy, Teaching Assistant Fall 2014  
General Chemistry Laboratory, Teaching Assistant Spring 2014  
Organic Chemistry Laboratory, Teaching Assistant Fall 2013

## **OUTREACH**

### **Medford High School STM Demonstration**

April 2016 – November 2019

- Delivered a short lecture on nanoscience, how the scanning tunneling microscope works, and ongoing research projects in the Sykes Lab (7 classes, 25 students each – 2 times a year)
- Performed real-time scanning demonstrations on HOPG sample and demonstrated STM-tip and sample preparation

### **Medford High School Reverse Science Fair**

October 2017 – Present

- Presented current research poster to high school students and guided them in experimental design and best research practices for their own Science Fair projects
- Served as a judge for the annual Medford High School Science Fair

## **AFFILIATIONS**

- American Chemical Society Member
- American Vacuum Society Member

2012 – Present

2016 – Present