



Michael G. Taylor

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## Education

- May 2019 **Expected: Ph.D. Chemical Engineering**, *University of Pittsburgh*, Pittsburgh, PA.  
Molecular modelling to elucidate nanomaterials growth and stability.  
Advisor: Prof. Giannis Mpourmpakis
- May 2013 **B.S. Chemical Engineering**, *University of Nebraska-Lincoln*, Lincoln, NE.  
*Cum Laude*

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## Research Experience

- 2014-Present **PhD. Candidate**, *University of Pittsburgh, Department of Chemical and Petroleum Engineering*, Pittsburgh, PA.  
**Atomically-precise nanoparticle growth and stabilization**  
Apply Density Functional Theory (DFT) methods to understand the stability and growth of metal nanoclusters. Findings used to develop methods for rapid computational design of hypothetical metal nanoclusters.  
**Stability and chemical reactivity of nanoalloys**  
Created a new model for screening the energetics of nanoalloys based on size, shape, composition, and chemical ordering. Currently applying this new model for metal nanoparticle and nanoalloy design.  
**Kidney stone growth modifier efficacy**  
Calculated adsorption and facet-preference for different growth modifiers to kidney stones helping rationalize dissolution of kidney stones observed in experiments.
- Summer 2012 **NSF Research Experience for Undergraduates (REU) Fellow**, *University of Pittsburgh*, Pittsburgh, PA.  
Advisor: J. Karl Johnson  
**Zwitterion-functionalized carbon nanotubes for desalination**  
Applied Molecular Dynamics (MD) to understanding desalination through carbon nanotube materials.
- 2011–2013 **Undergraduate Research Assistant**, *University of Nebraska-Lincoln*, Lincoln, NE.  
**Functionalized chitosan microspheres for targeted DNA detection**
- Summer 2010 **Undergraduate Research Assistant**, *Creighton University*, Omaha, NE.  
**Understanding inner-ear developmental biology in mouse models**

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## Publications

- [1] M. G. Taylor and G. Mpourmpakis. “Rethinking Heterometal Doping in Ligand-Protected Metal Nanoclusters.” In: *Journal of Physical Chemistry Letters, Cover Highlight* 9.23 (2018), pp. 6773–6778. DOI: 10.1021/acs.jpcllett.8b02679.
- [2] J. Chung, M. G. Taylor, I. Granja, J. R. Asplin, G. Mpourmpakis, and J. D. Rimer. “Factors Differentiating the Effectiveness of Polyprotic Acids as Inhibitors of Calcium Oxalate Crystallization in Kidney Stone Disease”. In: *Crystal Growth & Design* 18.9 (2018), pp. 1528–7483. DOI: 10.1021/acs.cgd.8b00945.
- [3] M. G. Taylor\*, Z. Yan\*, A. Mascareno, and G. Mpourmpakis. “Size-, Shape-, and Composition-Dependent Model for Metal Nanoparticle Stability Prediction”. In: *Nano Letters* 18.4 (2018), pp. 2696–2704. DOI: 10.1021/acs.nanolett.8b00670.

- [4] Q. Li, K. J. Lambright, M. G. Taylor, K. Kirschbaum, T.-Y. Luo, J. Zhao, G. Mpourmpakis, S. Mokashi-Punekar, N. L. Rosi, and R. Jin. “Reconstructing the Surface of Gold Nanoclusters by Cadmium Doping”. In: *Journal of the American Chemical Society* 139.49 (2017), pp. 17779–17782. DOI: 10.1021/jacs.7b11491.
- [5] Q. Li, M. G. Taylor, K. Kirschbaum, K. J. Lambright, X. Zhu, G. Mpourmpakis, and R. Jin. “Site-selective substitution of gold atoms in the Au<sub>24</sub>(SR)<sub>20</sub> nanocluster by silver”. In: *Journal of Colloid and Interface Science* 505 (2017), pp. 1202–1207. DOI: 10.1016/j.jcis.2017.06.049.
- [6] M. G. Taylor and G. Mpourmpakis. “Thermodynamic Stability of Ligand-Protected Metal Nanoclusters”. In: *Nature Communications* 8 (2017), p. 15988. DOI: 10.1038/ncomms15988.
- [7] M. G. Taylor\*, Q. Li\*, T.-y. Luo\*, S. Wang, X. Zhu, Y. Song, G. Mpourmpakis, N. L. Rosi, and R. Jin. “Molecular "surgery" on a 23-gold-atom nanoparticle”. In: *Science Advances* 3.5 (2017), e1603193. DOI: 10.1126/sciadv.1603193.
- [8] J. Chung, M. G. Taylor\*, I. Granja\*, G. Mpourmpakis, J. R. Asplin, and J. D. Rimer. “Molecular modifiers reveal a mechanism of pathological crystal growth inhibition”. In: *Nature* 536.7617 (2016), pp. 446–450. DOI: 10.1038/nature19062.
- [9] M. G. Taylor\*, N. Austin\*, C. Gounaris, and G. Mpourmpakis. “Catalyst Design Based on Morphology and Environment Dependent Adsorption on Metal Nanoparticles”. In: *ACS Catalysis* 5.11 (2015), pp. 6296–6301. DOI: 10.1021/acscatal.5b01696.
- [10] W. Chan, H.-y. Chen, A. Surapathi, M. G. Taylor, X. Shao, E. Marand, and J. K. Johnson. “Zwitterion Functionalized Carbon Nanotube / Polyamide Nanocomposite Membranes for Water Desalination”. In: *ACS Nano* 7.6 (2013), pp. 5308–5319. DOI: 10.1021/nn4011494.
- [11] N. Isenberg, M. G. Taylor, C. L. Hanselman, Z. Yan, G. Mpourmpakis, and C. Gounaris. “Accurate low-cost nanoparticle energetics and global optimization via tuned bond-cutting model.” In: *Targeted to Nature Communications* (2018), *Under Preparation*.
- [12] W. Li, M. G. Taylor, S. Mozaffari, S. Ivanov, S. Seifert, B. Lee, N. Shanaiah, Y. Lu, L. Kovarik, G. Mpourmpakis, and A. M. Karim. “Solvent Manipulation of the Pre-reduction Metal-Ligand Complex for Controlled Growth of Pd Nanoparticle.” In: *Targeted to Journal of the American Chemical Society* (2018), *Under Preparation*.
- [13] J. Dean, M. G. Taylor, Z. Yan, and G. Mpourmpakis. “Universal Adsorption Models on Metal Nanoparticles: Connecting Stability with Catalysis.” In: *Targeted to Science Advances* (2018), *Under Preparation*.

\* Indicates authors contributed equally to this work

## Awards and Grants

- Apr. 2016 **Graduate Research Fellowship Program (GRFP) - Awarded** , NSF, \$34,000 Stipend + \$12,000 Tuition Waiver for 3 Years.
- Oct. 2018 **CoMSEF Division Graduate Student Award (in recognition of substantial contributions to computational molecular sciences)**, AIChE , \$500.
- Dec. 2018 **Dr. James M. Coull Memorial Fellowship Award (highest honor for a graduate student as "most productive")**, Department of Chemical and Petroleum Engineering University of Pittsburgh, \$2000.
- Dec. 2017 **Led: Extreme Science and Engineering Discovery Environment (XSEDE) Proposal**, National Science Foundation (NSF), \$32,355.54.
- Apr. 2015 **GRFP - Honorable Mention**, NSF.
- Mar. 2017 **Best Poster Presentation (Travel Grant)**, Advancing Research through Computing (ARC) Conference, University of Pittsburgh, \$500.
- Jan. 2017 **GPSG Travel Grant**, University of Pittsburgh, \$500.
- Dec. 2016 **XSEDE Proposal (Contributed)**, NSF, \$28,015.28.

Dec. 2015 **XSEDE Proposal (Contributed)**, NSF, \$83,860.70.

Summer 2012 **Research Experience for Undergraduates (REU) Fellow**, NSF.

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## Oral Presentations

- [1] M. G. Taylor, Z. Yan, A. Mascareno, and G. Mpourmpakis. Development of a Bond-Centric Model Thermodynamic Stability of Nanoalloys. AICHE Annual Meeting 2018, Pittsburgh, PA, USA. 28 October 2018.
- [2] M. G. Taylor, Q. Li, R. Jin, and G. Mpourmpakis. Rationalizing Stability and Doping of Atomically Precise Ligand-Protected Metal Nanoclusters. AICHE Annual Meeting 2018, Pittsburgh, PA, USA. 30 October 2018.
- [3] M. G. Taylor, Z. Yan, A. Mascareno, and G. Mpourmpakis. Simple bond-centric model for accelerated nanoalloy energetics. ACS Fall National Meeting 2018, Boston, MA, USA. 19 August 2018.
- [4] M. G. Taylor, Q. Li, R. Jin, and G. Mpourmpakis. Molecular "surgery" and beyond: Understanding heterometal doping in atomically precise nanoclusters. ACS Fall National Meeting 2018, Boston, MA, USA. 21 August 2018.
- [5] M. G. Taylor and G. Mpourmpakis Rationalizing Stability of Atomically-precise, Ligand-protect Nanoclusters. Department of Chemical and Petroleum Engineering Research Day 2018, Pittsburgh, PA, USA. 20 February 2018
- [6] M. G. Taylor and G. Mpourmpakis. Structure-Dependent Stability of Magic-Number Thiolated Metal Nanoparticles. AICHE Annual Meeting 2016, San Francisco, CA, USA. 16 November 2016.
- [7] M. G. Taylor and G. Mpourmpakis. Modeling the structure-dependent stability of thiolated metal nanoparticles. ACS Fall National Meeting 2016, Philadelphia, PA, USA. 23 August 2016.
- [8] M. G. Taylor, J. Chung, I. Carnaval, J. D. Rimer and G. Mpourmpakis. Kidney Stone Growth Modification: Insights from First Principles Calculations. AICHE Annual Meeting 2015, Salt Lake City, UT, USA. 12 November 2015.
- [9] M. G. Taylor, J. Chung, I. Carnaval, J. D. Rimer, and G. Mpourmpakis Kidney Stone Growth Modification: Insights from First Principles. Carnegie Mellon University - Pittsburgh Simulator's Meeting 2015, Pittsburgh, PA, USA. 20 May 2015

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## Poster Presentations

- [1] M. G. Taylor and G. Mpourmpakis. Computer-Aided Description of Materials Stability at the Nanoscale. AICHE Annual Meeting 2018, Pittsburgh, PA, USA. 29 October 2018.
- [2] M. G. Taylor, Z. Yan, A. Mascareno, and G. Mpourmpakis Bond-Centric Model for Metal Nanoparticle Energetics. Pittsburgh Cleveland Catalysis Society (PCCS), Pittsburgh, PA, USA. 8 June 2018
- [3] M. G. Taylor and G. Mpourmpakis Stability and Prediction of Thiolated Metal Nanoclusters. Advancing Research through Computing (ARC) Conference, Pittsburgh, PA, USA. 2 March 2017
- [4] M. G. Taylor, J. Chung, J. D. Rimer, and G. Mpourmpakis Elucidating the Mechanisms for Kidney Stone Growth Inhibition and Dissolution. Department of Chemical and Petroleum Engineering Research Day 2016, Pittsburgh, PA, USA. 25 October 2016
- [5] M. G. Taylor and G. Mpourmpakis Exploring the Structure-Dependent Stability of Thiolated Metal Nanoparticles. Midwest Theoretical Chemistry Conference (MWTCC) 2016, Pittsburgh, PA, USA. 9 June 2016
- [6] M. G. Taylor, H-y. Chen, and J. K. Johnson Zwitterion-Functionalized CNTs for Efficient Desalination. AICHE Annual Meeting 2012 - Student Session, Pittsburgh, PA, USA. 29 October 2012
- [7] M. G. Taylor, J. Chung, I. Carnaval, J. D. Rimer, and G. Mpourmpakis Kidney Stone Growth Modification: Insights from First Principles. Department of Chemical and Petroleum Engineering Research Day 2015, Pittsburgh, PA, USA. 17 March 2015

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## Leadership, Outreach, and Broader Impacts

- May 2018 **Intel International Science and Engineering Fair (ISEF)**, *Pittsburgh, PA*.  
Served as a Grand Awards judge for the chemistry division with an emphasis on advances in computational chemistry.
- 2015-2017 **Chemical Engineering Graduate Student Association (GSA) President**, *University of Pittsburgh*.  
**Organization:** Led the department research day 2016. Started and coordinated joint happy hours with Carnegie Mellon University department of chemical engineering 2015-2016. Helped coordinate recruiting events for incoming PhD students 2015-2017.  
**Volunteering:** Co-coordinated department involvement in educational outreach at the Engineer the Future and National Chemistry Day events at the Carnegie Science center in Pittsburgh with *at least 4,000 students*, 2016-2017. Helped lead volunteer efforts to clean the city of Pittsburgh.
- 2017-2019 **Ingenium editorial board**, *Swanson School of Engineering*, University of Pittsburgh.  
Served on the editorial board as a reviewer for Ingenium, the School of Engineering undergraduate research publication.
- Apr. 2017 **High school outreach presentation**, *Central Catholic High School*, Pittsburgh, PA.  
Presented an informative and motivational talk on personal experiences as a chemical engineer and as a scientist to a high school, pre-engineering class of around 50 students.
- Apr. 2016 **Undergraduate research seminar presentation**, *University of Pittsburgh*, Department of Chemical Engineering.  
Presented personal research and experiences in graduate school to the undergraduates in the department towards inspiring and influencing them towards careers in science.
- Apr. 2015 **ISEF**, *Pittsburgh, PA*.  
Served as volunteer for safety and initial inspection of posters at the international high-school science fair.

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## Teaching and Advising Experience

- 2015-2018 **Research mentoring and advising**.  
Undergraduates: Isadora Carnaval (2015), Peter Tancini (2015-2016), John Hoover (2016), Ashley Mascareno (Summer 2017) (Co-Author on publication)  
Masters: Zihao Yan (2016-2018) (1st author publication)
- Spring 2017 **Teaching Assistant, CHE 200 - Chemical Engineering Thermodynamics**, *University of Pittsburgh*, 70 Students.  
Lead five, 2-hour recitations on problem solving and further conceptual understanding.  
Presented 2-hour lecture on excess properties and the thermodynamics of mixtures, connected these properties to cutting-edge research.
- Spring 2016 **Teaching Assistant, CHE 200 - Chemical Engineering Thermodynamics**, *University of Pittsburgh*, 70 Students.  
Presented 2-hour lecture on chemical equilibrium and chemical potential.
- Spring 2015 **Teaching Assistant, CHE 200 - Chemical Engineering Thermodynamics**, *University of Pittsburgh*, 70 Students.  
Advised several students individually on future career directions and graduate school applications.

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## Professional Society Memberships

- 2012-Present **American Institute of Chemical Engineers (AIChE)**.  
2015-Present **American Chemical Society (ACS)**.  
2013-Present **Tau Beta Pi Engineering Honors Fraternity (TBP)**.

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## Computational Expertise

Languages	Proficient in: Python, BASH, ASE package, R, MATLAB, Some experience in FORTRAN
Modeling	CP <sub>2</sub> K (Molecular and Periodic DFT), Turbomole, LAMMPS, DFTB+, Gaussian
Platforms	GNU/Linux (Redhat/Ubuntu), MacOS, Windows
Typesetting	L <sup>A</sup> T <sub>E</sub> X, Markdown, Word
Web	Github Pages/Jekyll
Visualization	Blender, GIMP, Origin, Inkscape, Matplotlib
Development	git, vim

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## Relevant Graduate Coursework

- Spring 2017 **CMCHE 0611**, *Computer Science for Chemical Engineers*.  
Fall 2016 **IE 3097**, *Algorithms for Engineers*.  
Fall 2016 **CHEM 2620**, *Atoms, Molecules, and Materials*.  
Spring 2016 **CHE 3460**, *Advanced Scientific Visual Communication*.  
Fall 2015 **STAT 2270**, *Data Mining*.  
Fall 2015 **MSE 2003**, *Structure of Materials*.  
Spring 2015 **CHE 2017**, *Chemical Energy and the Nature of the Chemical Bond*.

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## References

### **Dr. Giannis Mpourmpakis.**

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