

Addison Killean Stark

94 Alban St #2
Boston, MA 02124
M +1 (563) 357 4880
E akstark@alum.mit.edu

Education

- 2010–2015 **Ph.D.**, *Mechanical Engineering, M.I.T.*, Cambridge, MA.
2009–2010 **S.M.**, *Mechanical Engineering, M.I.T.*, Cambridge, MA.
2007–2010 **S.M.**, *Technology and Policy, M.I.T.*, Cambridge, MA.
2002–2007 **B.S. & B.A.**, *Mathematics & Chemistry, University of Iowa*, Iowa City, IA.
With honors and distinction & minor in German.

Theses

- doctoral dissertation *Multi-Scale Chemistry Modeling of Biomass Gasification in a Fluidized Bed Reactor*
supervisor Prof. Ahmed F. Ghoniem (MechE)
committee Profs. William H. Green (ChemE), Yuriy Román (ChemE), Cullen Buie (MechE)
- dual masters thesis *Multi-Criteria Lifecycle Evaluation of Transportation Fuels Derived From Biomass Gasification*
supervisors Dr. Daniel Cohn, Prof. Ahmed F. Ghoniem

Professional Experience

- Jan 2016 - **Acting Program Director, ARPA-E**, Washington, DC.
Present
 - Acting Program Director for \$33 million Advanced Research In Dry-Cooling (ARID) Program and 3 IDEAS projects.
 - Actively managing 16 projects across Technology Readiness Levels, including follow-on funding decisions, cancellations and re-scoping.
 - Managing team of 5 support contractors and analysts in funding and project management activities.
 - Actively leading development of high-risk high-reward R&D programs in applications of advanced manufacturing, advanced chemical reactor design and chemical conversions.
- Jan 2015 - **Fellow, ARPA-E**, Washington, DC.
Present
 - Actively collaborated on development of high-risk high-reward R&D programs in advanced fuels and energy-water nexus.
 - Contributed to the development of INTEGRATE, ROOTS, MARINER and REFUEL Programs.
 - Led Fellow recruiting efforts.
 - Led student program for 100 select student participants at ARPA-E Summit.
- May 2017 - **Technical Advisor, Aestus Energy Storage**, Rochester, NY.
Present
 - Advising thermal energy storage company on technical and business development pathways.

- Sept 2015 - **Technical Advisor**, *UrbanX Renewables Group*, Long Beach, CA.
Present ○ Leading design and acquisition of advanced diesel bio-refinery for utilization of low-value brown grease to drop-in-ready diesel fuel.
- Summer 2012 **ORISE Fellow**, *ARPA-E*, Washington, DC.
○ Assessed feasibility of a Small Modular Methane Utilization Program
○ Convened workshop of leading experts on conversion chemistry, reactor design and process intensification from industry, academia and professional research organizations.

Research Experience

- Jan 2010–Dec 2014 **Research Assistant**, *Reacting Gas Dynamics Laboratory, MIT*, Cambridge, MA.
2014 Advisor: Ahmed F. Ghoniem.
○ Investigated combustion, pyrolysis and gasification dynamics of biomass at the particle and reactor scales.
○ Developed intrinsic physiochemical models of biomass conversion to inform reactor scale modeling efforts.
○ Culminated in doctoral thesis, multiple presentations and publications.
- Sept 2007–Dec 2010 **Research Assistant**, *MIT Energy Initiative*, Cambridge, MA.
Advisor: Daniel Cohn.
○ Investigated alternative transportation fuels from biomass gasification on a life-cycle basis.
○ Developed multi-criteria method to evaluate the energetics, economics and integrability of different fuels.
○ Culminated in masters thesis and multiple presentations.
- 2006–2007 **Undergraduate Research Fellow**, *Department of Mathematics, University of Iowa*, Iowa City, IA.
Advisors: Drs. Palle Jørgensen & William Klink.
○ Computationally verified convergence of the Lie Group induced representation of the anharmonic oscillator to the full quantum mechanical solution.
○ Culminated in honors thesis.
- 2003–2006 **Undergraduate Research Assistant**, *Department of Chemistry, University of Iowa*, Iowa City, IA.
Advisor: Johna Leddy.
○ Developed protocol to produce inert magnetic microparticles for application in electrochemical systems.
○ Adapted techniques for ferrous magnets to neodymium and samarium systems.
○ Culminated in three poster presentations.

Teaching Experience

- Fa 2009 **Head TA**, *Sustainable Energy*, MIT.
○ Large (>50 students) multi-disciplinary introductory graduate and cap-stone undergraduate course.
○ Developed homeworks, exams, and mentored student projects.
○ Coordinated large roster of guest lecturers from MIT, Harvard and Industry.
- Sum 2009 **Course Development TA**, *Sustainable Energy*, MIT.
- Spr 2006 **Laboratory TA**, *Principles of Chemistry I*, University of Iowa.

Spr 2005 **Recitation Leader**, *Engineering Math II: Multivariable Calculus*, University of Iowa.

Publications

Journal Articles

Addison K. Stark, James F. Klausner. *An R&D Strategy to Decouple Energy from Water*. Joule, In Press, 2017.

Addison K. Stark. *Methods for Rejecting Daytime Waste heat to Outer Space*. National Science Review, In Press, 2017.

Addison K. Stark, Ahmed F. Ghoniem. *Quantification of Particle Diameter on Polycyclic Aromatic Hydrocarbon (PAH) Formation in Fluidized Bed Biomass Gasification and Pyrolysis*. Fuel 206, 2017.

Addison K. Stark, Christos Altantzis, Richard B. Bates, Ahmed F. Ghoniem. *Towards an Advanced Reactor Network Modeling Framework for Fluidized Bed Biomass Gasification: Incorporating Information from Detailed CFD Simulations*. Chemical Engineering Journal 303, 2016.

Addison K. Stark, Richard B. Bates, Zhenlong Zhao, Ahmed F. Ghoniem. *Prediction and Validation of Major Gas and Tar Species from a Reactor Network Model of Air-Blown Fluidized Bed Biomass Gasification*. Energy and Fuels 29(4), 2015.

Akhilesh Bakshi, Christos Altantzis, A. Bershanska **Addison K. Stark**, Ahmed F. Ghoniem. *On the Limitations of 2D CFD for Lab-Scale Fluidized Bed Simulations*., In Review, Powder Technology.

Addison K. Stark, *Manufactured chemistry: Opportunities for advanced manufacturing and design techniques in chemical engineering*. Invited Perspective, In Preparation for AIChE Journal.

Addison K. Stark, Akhilesh Bakshi, Christos Altantzis, Richard B. Bates and Ahmed F. Ghoniem. *A Review of Multi-Scale Simulation of Fluidized Bed Biomass Gasification*. In Preparation for Progress in Energy and Combustion Science.

Invited, Opinion and Popular Press Publications

Addison K. Stark, *Land Grant 2023: Massively Open Online Extension Services*. The Evollution online, March, 2013.

Addison K. Stark, *Living Up to MIT's Land Grant Commitment*. The Tech, September, 21, 2012.

Addison K. Stark, *Peering Over the Valley of Death at the MIT Sloan Energy Finance Forum*. Xconomy Boston. December 10th, 2010.

Addison K. Stark, *Consider the Shortfalls of Moving Away from Coal*. Daily Iowan. May 13th, 2010.

Invited Talks

- Google[x] *Manufactured Chemistry: Rethinking Reactor Design in the Age of Advanced Manufacturing*. Google X Invited Tech Talk, Mountain View, CA, August 2nd, 2017.
- Politecnico di Milano *Multi-Scale Modeling of Biomass Gasification*. Department of Chemical Engineering, Milano, Italy, June 19th, 2017.
- EPRI *Tech-to-Market for Dry Cooling Technologies*. EPRI-NSF Program Review, Palo Alto, CA, May 17th, 2017.
- Michigan State University *Applications of Multi-Scale Modeling and Advanced Manufacturing in Thermal and Chemical Engineering*. Department of Mechanical Engineering, East Lansing, MI, January 31st, 2017.
- Princeton University *The Energy-Water Nexus*. Invited Panelist, Princeton Adlinger Center for Energy and the Environment E-filiates Annual Meeting, Princeton, NJ, November 11th, 2016.
- Columbia University *Perspectives on Applications of Multi-Scale Modeling and Advanced Manufacturing in Thermal and Chemical Engineering*. Lenfest Center for Sustainable Energy, Department of Chemical Engineering, New York, NY, November 10th, 2016.
- Air Cooled Condenser Users Group *An R&D Strategy to Decouple Energy from Water*. Invited Speaker, Air-Cooled Condenser Users Group Annual Meeting, Dallas, TX, October 3-6th, 2016.
- Iowa EPSCoR *Pushing Boundaries in Bioenergy Innovation*. Keynote Speaker, Iowa EPSCoR Annual Meeting, Cedar Rapids, IA, July 25th, 2016.
- ASME *Driving Innovation in Thermal Engineering*. Invited Panelist, ASME Summer Heat Transfer Conference, Washington, DC, July 12th, 2016.
- University of Louisville *Driving Energy Innovation at ARPA-E*. Invited seminar presentation, Conn Center for Renewable Energy Research, University of Louisville, Louisville, KY, May 23rd, 2016.
- Army Research Laboratory *Addressing the Energy-Water Nexus at ARPA-E*. Invited seminar presentation, Army Research Laboratory Mechanical Working Group, Adelphi, MD, May 18th, 2016.
- MIT *Addressing the Energy-Water Nexus at ARPA-E*. Invited seminar presentation, Center for Energy and Propulsion Research, Department of Mechanical Engineering, MIT, Cambridge, MA, April 13th, 2016.
- RPI *Perspectives on Advanced Manufacturing and Process Intensification for Energy Applications*. Invited seminar presentation, Center for Automation Technologies and Systems (CATS), Rensselaer Polytechnic Institute, Troy, NY, May 5th, 2015.
- Iowa State University *Multi-Scale Chemistry Modeling of Thermochemical Biomass Conversion*. Biorenewables Research Laboratory. Ames, IA. Oct 3rd, 2013.

Brown University *Multi-Scale Chemistry Modeling of Biomass Conversion in a Fluidized Bed Gasifier*. Catalyst Design Laboratory, School of Engineering. Providence, RI. July 10th, 2013.

ARPA-E *Thermochemical Conversion of Lignocellulosic Biomass for the Production of Biofuels*. ARPA-E Seminar. Washington, DC. September 7th, 2012.

Conference Proceedings and Presentations

Geoffrey Short, **Addison K. Stark** (presenting author), Daniel Matuszak, James F. Klausner. *Towards a Technoeconomic Framework for Estimating Cost-Performance Tradeoffs for Power Plants Incorporating Transformative Dry-Cooling Technologies*. In Proceedings of the ASME International Mechanical Engineering Congress and Exposition 68085, Nov 14, 2016.

Addison K. Stark. *Towards a Multi-scale Modeling Framework for Fluidized Bed Reactor Simulation*. To appear at the Symposium on Thermal and Catalytic Sciences for Biofuels and Biobased Products, Chapel Hill, NC. Nov 1-4, 2016

Akhilesh Bakshi, Christos Altantzis, **Addison K. Stark**, Richard B. Bates and Ahmed F. Ghoniem. *Steam-Blown Biomass Gasification in Fluidized Beds: Gas-Flow Distribution for Advanced Reactor Network Models*. Presentation at the AIChE Annual Meeting, San Francisco, CA. Nov 15th, 2016.

Christos Altantzis, **Addison K. Stark**, Richard B. Bates, Whitney S. Jablonski, Daniel Carpenter, Akhilesh Bakshi, Rajesh Sridhar, Aaron Garg, John L. Barton, Ran Chen and Ahmed F. Ghoniem. *Numerical Simulation of Biomass Gasification In a Steam-Blown Bubbling Fluidized Bed: A Validation Study*. Presentation at the AIChE Annual Meeting, Salt Lake City, UT. Nov 10th, 2015.

Christos Altantzis, **Addison K. Stark**, Richard B. Bates, Akhilesh Bakshi, Rajesh Sridhar, Ahmed F. Ghoniem. *Numerical Simulation of Biomass Gasification in a Steam-Blown Bubbling Fluidized Bed*. NETL Multiphase Flow Science Workshop, Morgantown, WV. August 12th, 2015.

Addison K. Stark, Christos Altantzis, Ahmed F. Ghoniem. *CFD Study of Lignocellulosic Biomass Gasification in a Fluidized Bed Gasifier: A Study of the Impact of Particle Radius on Devolatilization and Mixing*. Presentation at the AIChE Annual Meeting, Atlanta, GA. Nov 5th, 2014.

Addison K. Stark, Richard B. Bates, Zhenlong Zhao, Ahmed F. Ghoniem. *Comparison of Reduced Kinetic Mechanisms for Gas Phase Reactions in Fluidized Bed Biomass Gasification*. Presentation at the AIChE Annual Meeting, San Francisco, CA. Nov 4th, 2013.

Addison K. Stark, Christos Altantzis, Ahmed F. Ghoniem. *CFD Study of Lignocellulosic Biomass Gasification in a Fluidized Bed Gasifier: A Comparison of Eulerian and Lagrangian Representations of the Biomass Fuel*. Presentation at the AIChE Annual Meeting, San Francisco, CA. Nov 4th, 2013.

Addison K. Stark, Ahmed F. Ghoniem. *Multi-Physics Particle Model of Biomass Pyrolysis in a Fluidized Bed Reactor*. Poster presentation at TCBiomass2013, Chicago, IL. Sept 4-5, 2013.

Addison K. Stark, Christos Altantzis, Ahmed F. Ghoniem. *CFD Modeling of Wood Sawdust Gasification in a Laboratory-Scale Fluidized Bed Reactor*. Contributed Paper at the SIAM Fourteenth International Conference on Numerical Combustion, San Antonio, TX. April 10, 2013.

Addison K. Stark, Daniel Cohn, Ahmed F. Ghoniem. *Multi-Criteria Lifecycle Evaluation of Transportation Fuels Derived from Ligno-Cellulosic Biomass Gasification*. Presentation at The Symposium on Thermal and Catalytic Sciences for Biofuels and Biobased Products, Ames, IA. September 21-23, 2010.

Addison K. Stark, Daniel Cohn. *Lifecycle Analysis of Thermochemical Biofuels*. Poster presentation at the UC Berkeley Energy Symposium, Berkeley, CA. February 23, 2009.

Addison K. Stark, Daniel Cohn. *High Efficiency Methanol Engines*. Poster presentation at the MIT Energy Conference, Cambridge, MA. April 11, 2008.

Pearl Donohoo, Donald MacKenzie, Jeffrey McAulay, Julio Pertuze, **Addison K. Stark**. *A Review of Biofuel Policies in the Energy Independence and Security Act of 2007: Filling in the Holes*. Presentation at the AAAS STGlobal Science and Technology in Society Conference, Washington, DC. April 5-6, 2008.

Addison K. Stark, Luke Haverhals, Johna Leddy. *Magnetically Modified Fuel Cells*. Poster presentation at Iowa Research in the Capitol, Des Moines, IA. March 6, 2008.

Addison K. Stark, Luke Haverhals, Johna Leddy. *Novel Methods in Synthesizing Inert NdFeB and SmCo Magnets*. Paper presentation at the annual midwest regional meeting of the AIChE, Manhattan, KS. April 1, 2005.

Addison K. Stark, Luke Haverhals, Johna Leddy. *Making Magnetic Microparticles Inert: Applications in Extreme Chemical Conditions*. Poster presentation at the annual national meeting of the AIChE, Austin, TX. November 9, 2004.

Conference Panel and Workshop Organization

2017 *Workshop on Process Intensification and Reactor Design: Towards Integrated Heat Exchanger Reactors*. Organized at the 2017 ASME Summer Heat Transfer Conference in Bellevue Washington, July 9-12th.

2017 *Panel on Federal Funding Opportunities*. Organized at the 2017 ASME Summer Heat Transfer Conference in Bellevue, Washington, July 9-12th.

Awards & Honors

2015–present ARPA-E Fellowship

2012 Department of Energy ORISE Fellowship.

2007–2009 John & Jane Bradley Fellowship, MIT Energy Initiative.

2006–2007 NSF-VIGRE Undergraduate Research Fellowship.

2006 Ken Sando Undergraduate Chemistry Scholarship.

2002–2006 National Merit Special Scholar.

2005 Elected Phi Beta Kappa.

Leadership and Service

- 2017–present Workshop and panel organizer for ASME Heat Transfer Division.
- 2013–2014 MIT Corporation Joint Advisory Committee on Institute-Wide Affairs.
 - 2012 MIT Presidential Search Student Advisory Committee.
- 2010–2011 MIT Energy Club President.
- 2010–2012 MIT Energy Education Task Force.
- 2006–2007 Vice President of the Student Body, University of Iowa.
 - 2006 University of Iowa Associate Provost for Undergraduate Education Search Committee.
- 2005–2007 University of Iowa Energy Conservation Advisory Council.