

Juan Pablo Trelles

Associate Professor
 Department of Mechanical Engineering
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A. EDUCATION AND ACADEMIC QUALIFICATIONS

A.1. Education

Ph.D. in Mechanical Engineering Sept. 2007

Department of Mechanical Engineering
 Minor Aerospace Engineering
 University of Minnesota, Minneapolis, Minnesota

Dissertation: “*Finite Element Modeling of Flow Instabilities in Arc Plasma Torches*”

Adviser: Prof. Joachim Heberlein

Committee: Prof. Joachim Heberlein Prof. Emil Pfender, Prof. Graham Candler, Prof. Paul Strykowski

M.S. in Energy Engineering June 2003

Department of Mechanical Engineering
 University of Massachusetts, Lowell, Massachusetts

Thesis: “*Numerical Analysis of Latent Heat Thermal Energy Storage for Solar Thermoelectric Vaccine Refrigeration*”

Adviser: Prof. John Duffy

Committee: Prof. John Duffy, Prof. John McKelliget, Prof. John White

B.S. in Mechanical Engineering July 2001

Department of Mechanical Engineering
 Universidad Nacional de Ingeniería, Lima, Perú

Thesis: “*Modeling and Design Optimization of a Biogas Carburetor*”

Adviser: Prof. Guillermo Lira Cacho

Committee: Prof. Guillermo Lira Cacho, Prof. Alfredo Oliveros, Prof. Jorge Ponce Galiano

A.2. Academic Experience

Associate Professor June 2018 – present

Department of Mechanical Engineering and Energy Engineering Graduate Program
 University of Massachusetts, Lowell, Massachusetts

Assistant Professor Aug. 2012 – June 2018

Department of Mechanical Engineering and Energy Engineering Graduate Program
 University of Massachusetts, Lowell, Massachusetts

Post-Doctoral Associate Oct. 2007 – Dec. 2007

High Temperature and Plasma Laboratory, Department of Mechanical Engineering
 University of Minnesota, Minneapolis, Minnesota

Research Assistant Sept. 2003 – Sept. 2007

High Temperature and Plasma Laboratory, Department of Mechanical Engineering
 University of Minnesota, Minneapolis, Minnesota

Teaching Assistant Sept. 2001 – June 2003

Department of Mechanical Engineering
 University of Massachusetts, Lowell, Massachusetts

Research Assistant June 1999 – Dec. 2000

Instituto de Motores de Combustión Interna, Departamento de Ingeniería Mecánica
 Universidad Nacional de Ingeniería, Lima, Perú

B. PROFESSIONAL ACTIVITIES

B.1. Professional Association Member

| | |
|---|-------------|
| American Society of Mechanical Engineers (ASME) | since 2006 |
| Institute of Electrical and Electronics Engineers (IEEE) | since 2005 |
| Society of Hispanic Professional Engineers (SHPE) | since 2013 |
| American Institute of Chemical Engineers (AIChE) | since 2017 |
| American Society of Engineering Education (ASEE) | 2013 – 2014 |
| American Institute of Aeronautics and Astronautics (AIAA) | 2006 – 2009 |

B.2. Professional Honors and Awards

| | |
|---|------|
| Excellent Reviewer in 2017 Journal of Thermal Spray Technology | 2018 |
| Teaching Excellence Award Department of Mechanical Engineering, University of Massachusetts Lowell | 2018 |
| Early Career Research Award U.S. Department of Energy (DOE), Office of Science | 2017 |
| CAREER Award U.S. National Science Foundation (NSF) | 2015 |
| Who's Who in America 2018 Marquis Who's Who LLC, New Providence, New Jersey | 2017 |
| Who's Who in America 2015 Marquis Who's Who LLC, New Providence, New Jersey | 2014 |
| Logic Technology Development Division Award Technology Manufacturing Group, Intel Corporation, Hillsboro, Oregon | 2011 |
| Design and Technology Solutions Division Award Technology Manufacturing Group, Intel Corporation, Hillsboro, Oregon | 2009 |
| Best Dissertation Award Nominee University of Minnesota, Minneapolis, Minnesota | 2009 |
| Doctoral Dissertation Fellowship University of Minnesota, Minneapolis, Minnesota | 2006 |
| Outstanding Graduate Student Award University of Massachusetts, Lowell, Massachusetts | 2002 |
| First-Rate of Civil Service of the State Peruvian distinction, granted by the government of Malvas, Malvas, Perú | 2001 |
| Diploma, Ranked First from the Class of 2000-II Universidad Nacional de Ingeniería, Lima, Perú | 2000 |
| Diploma, Ranked First from the Mechanical Engineering Department Universidad Nacional de Ingeniería, Lima, Perú | 1999 |
| General Brigadier Leoncio Prado Military School, Callao, Perú | 1994 |

B.3. Non-Teaching Activities

B.3.a. Professional Experience (Non-Academic)

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|--|-----------------------|
| Senior Software Engineer Process Technology Modeling, Technology Manufacturing Group Intel Corporation, Hillsboro, Oregon | Dec. 2007 – June 2012 |
| Engineer, Assistant to the Minister Office of Advisers, Ministry of Energy and Mines, Lima, Perú | Dec. 2000 – July 2001 |
| Engineering Intern Alfa Plus S.A., Lima, Perú | Jan. 1999 – Aug. 2000 |

B.3.b. Professional Licenses

Professional Engineer Title

Granted by Universidad Nacional de Ingeniería, Lima, Perú

Sept. 2001

B.3.c. Reviewer

Scientific Journals (14)

| | |
|--|------------|
| <i>Plasma Chemistry and Plasma Processing</i> , Springer | since 2012 |
| <i>Scientific Reports</i> , Nature Publishing | since 2017 |
| <i>Physics of Plasmas</i> , American Institute of Physics Publishing | since 2016 |
| <i>Energy Conversion and Management</i> , Elsevier, LTD | since 2012 |
| <i>Journal of Physics D: Applied Physics</i> , Institute of Physics Publishing | since 2010 |
| <i>Journal of Applied Physics</i> , American Institute of Physics Publishing | since 2016 |
| <i>Computers and Fluids</i> , Elsevier, LTD | since 2014 |
| <i>International Journal of Heat and Mass Transfer</i> , Elsevier, LTD | since 2009 |
| <i>Entropy</i> , Molecular Diversity Preservation International | since 2009 |
| <i>Energies</i> , MDPI Publishing | since 2013 |
| <i>IEEE Transactions on Plasma Science</i> , IEEE Nuclear Plasma Society | since 2008 |
| <i>Plasma Sources Science and Technology</i> , Institute of Physics Publishing | since 2008 |
| <i>Vacuum</i> , Elsevier, LTD | since 2007 |
| <i>International Journal of Thermal Sciences</i> , Elsevier, LTD | since 2006 |
| <i>Experimental Thermal Fluid Science</i> , Elsevier, LTD | since 2004 |

Governmental Agencies (3)

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| U.S. Department of Energy (DOE) | since 2018 |
| Netherlands Organization for Scientific Research (NWO, the Dutch Research Council) | since 2017 |
| U.S. National Science Foundation (NSF) | since 2015 |
| Czech Science Foundation (GACR) | since 2012 |

C. RESEARCH

C.1. Grants & Contracts

C.1.a. Grants

“Nonequilibrium Phenomena in Plasmas in Contact with Liquids” (DE-SC0018230)

Agency: **U.S. Department of Energy (DOE)**, Office of Science, Fusion Energy Sciences (FES)
Investigators: **J. P. Trelles** (sole PI, 100%)
Period: Sept. 1, 2017 – Aug. 31, 2022
Amount: \$750,078.00

“Clean Energy Innovation Institute (CEII)”

Agency: **University of Massachusetts (UMass)**, President’s Science and Technology Initiatives Fund
Investigators: C. Niezriecki (PI), E. Agar, S. Aghara, H. Mack, W. Thomas, **J. P. Trelles** (Co-PI, 20%)
Period: July 1, 2017 – June 30, 2018
Amount: \$95,000.00

“CAREER: Sustainable Chemical Synthesis by Plasma-Enhanced Solar Energy” (CBET-1552037)

Agency: **National Science Foundation (NSF)**, Division of Chemical, Bioengineering, Environmental, and Transport Systems (CBET), Energy for Sustainability
Investigators: **J. P. Trelles** (sole PI, 100%)
Period: Feb. 1, 2016 – Jan. 31, 2021
Amount: \$519,121.00 (\$513,121.00 plus \$6,000.00 REU award)

“SPACE HAUC: Science Program Around Communication Engineering with High Achieving Undergraduate Cadres”

Agency: **National Aeronautics and Space Administration (NASA)**, NASA Office of Education (OE) and the Science Mission Directorate (SMD)
Investigators: Timothy Cook (PI), Christopher J. Hansen, **J. P. Trelles** (Co-PI, 20%)
Period: Feb. 1, 2016 – Dec. 31, 2017
Amount: \$200,000.00

“Multi-scale Approach for the Comprehensive Modeling and Simulation of Non-Equilibrium Atmospheric-Pressure Turbulent Plasma Flows” (PHY-1301935)

Agency: **National Science Foundation (NSF)**, Division of Physics (PHY), NSF-DOE Partnership in Basic Plasma Science and Engineering
Investigators: **J. P. Trelles** (sole PI, 100%)
Period: Sept. 1, 2013 – Aug. 31, 2016 (no-cost extension to Aug. 31, 2017)
Amount: \$150,001.00

C.1.b. Contracts

“Plasma Chamber CFD Modeling”

Agency: **Boxer Industries Inc.**
Investigators: **J. P. Trelles** (sole PI, 100%)
Period: June 18, 2013 – Dec. 31, 2013
Amount: \$32,279.60

C.2. Academic & Professional Publications

C.2.a. Refereed Archival Journals

[24] **J. P. Trelles**, “Viewpoint on ‘A collisional-radiative model of iron vapour in a thermal arc plasma’ by M Baeva, D Ubrlandt and A B Murphy (2017 *J. Phys. D: Appl. Phys.* 50 22LT02)”, *Journal of Physics D: Applied Physics* (2017), Vol. 50, 431001. [DOI: 10.1088/1361-6463/aa8ac8](https://doi.org/10.1088/1361-6463/aa8ac8)

Invited contribution

[23] C. Chazelas, **J. P. Trelles**, I. Choquet, A. Vardelle, “Main Issues for a Fully Predictive Plasma Spray Torch Model

- and Numerical Considerations*”, Plasma Chemistry and Plasma Processing (2017), Vol. 37, No. 3, pp. 627-651. DOI: [10.1007/s11090-017-9808-8](https://doi.org/10.1007/s11090-017-9808-8)
- [22] C. Chazelas, **J. P. Trelles**, A. Vardelle, “*The Main Issues to Address in Modeling Plasma Spray Torch Operation*”, Journal of Thermal Spray Technology (2016), Vol. 26, No. 1, pp. 3-11. DOI: [10.1007/s11666-016-0500-y](https://doi.org/10.1007/s11666-016-0500-y)
- [21] S. Bhatta, D. Nagassou, **J. P. Trelles**, “*Solar Photo-Thermochemical Reactor Design For Carbon Dioxide Processing*”, Solar Energy (2017), Vol. 142, pp. 253–266. DOI: [10.1016/j.solener.2016.12.031](https://doi.org/10.1016/j.solener.2016.12.031)
- [20] A. Vardelle, C. Moreau, J. Akedo, H. Ashrafizadeh, C. C. Berndt, J. Oberste Berghaus, M. Boulos, J. Brogan, A. C. Bourtsalas, A. Dolatabadi, M. Dorfman, T. J. Eden, P. Fauchais, G. Fisher, F. Gaertner, M. Gindrat, R. Henne, M. Hyland, E. Irissou, E. H. Jordan, K. A. Khor, A. Killinger, Y.-C. Lau, C.-J. Li, L. Li, J. Longtin, N. Markocsan, P. J. Masset, Jiri Matejcek, G. Mauer, A. McDonald, J. Mostaghimi, S. Sampath, G. Schiller, K. Shinoda, M. F. Smith, A. Ansar Syed, N. J. Themelis, F.-L. Toma, **J. P. Trelles**, R. Vassen, P. Vuoristo, “*The 2016 Thermal Spray Roadmap*”, Journal of Thermal Spray Technology (2016), Vol. 25, No. 8, pp. 1376–144. DOI: [10.1007/s11666-016-0473-x](https://doi.org/10.1007/s11666-016-0473-x)
- [19] **J. P. Trelles**, “*Finite Element Methods for Arc Discharge Simulation*”, Plasma Processes and Polymers (2017), Vol. 14, No. 1-2, 1600092. DOI: [10.1002/ppap.201600092](https://doi.org/10.1002/ppap.201600092)
Invited contribution to the special issue on ‘Plasma modeling’
- [18] **J. P. Trelles**, “*Pattern Formation and Self-Organization in Plasmas Interacting with Surfaces*”, Journal of Physics D: Applied Physics (2016), Vol. 49, No. 39, 393002. DOI: [10.1088/0022-3727/49/39/393002](https://doi.org/10.1088/0022-3727/49/39/393002)
Invited topical review
- [17] S. M. Modir Khazeni, **J. P. Trelles**, “*Algebraic Approximation of Sub-Grid Scales for the Variational Multiscale Modeling of Transport Problems*”, Computer Methods in Applied Mechanics and Engineering (2016) Vol. 306, pp. 276-298. DOI: [10.1016/j.cma.2016.03.041](https://doi.org/10.1016/j.cma.2016.03.041)
- [16] M. Gautier, V. Rohani, L. Fulcheri, **J. P. Trelles**, “*Influence of Temperature and Pressure on Carbon Black Size Distribution during Allothermal Cracking of Methane*”, Aerosol Science and Technology (2016), Vol. 50, No. 1, 26-40. DOI: [10.1080/02786826.2015.1123214](https://doi.org/10.1080/02786826.2015.1123214)
- [15] R. O. Castro, **J. P. Trelles**, “*Spatial and Angular Finite Element Method for Radiative Transfer in Participating Media*”, Journal of Quantitative Spectroscopy and Radiative Transfer (2015) Vol. 157, pp. 81-105. DOI: [10.1016/j.jqsrt.2015.02.008](https://doi.org/10.1016/j.jqsrt.2015.02.008)
- [14] **J. P. Trelles**, S. M. Modir Khazeni, “*Variational Multiscale Method for Nonequilibrium Plasma Flows*”, Computer Methods in Applied Mechanics and Engineering (2014) Vol. 282, pp. 87-131. DOI: [10.1016/j.cma.2014.09.001](https://doi.org/10.1016/j.cma.2014.09.001)
- [13] **J. P. Trelles**, “*Electrode Patterns in Arc Discharge Simulations: Effect of Anode Cooling*”, Plasma Sources Science and Technology (2014), Vol. 23, No. 5, 054002. DOI: [10.1088/0963-0252/23/5/054002](https://doi.org/10.1088/0963-0252/23/5/054002)
Invited to the special issue on ‘Spots and patterns on electrodes of gas discharges’
- [12] **J. P. Trelles**, “*Identification of Coherent Flow Structures in Non-Equilibrium Plasmas*”, IEEE Transactions on Plasma Science (2014), Vol. 42, No. 10, pp. 2852-2853. DOI: [10.1109/TPS.2014.2345063](https://doi.org/10.1109/TPS.2014.2345063)
- [11] **J. P. Trelles**, “*Computational Study of Flow Dynamics from a DC Arc Plasma Jet*”, Journal of Physics D: Applied Physics (2013) Vol. 46, No. 25, 255201. DOI: [10.1088/0022-3727/46/25/255201](https://doi.org/10.1088/0022-3727/46/25/255201)
- [10] **J. P. Trelles**, “*Formation of Self-Organized Anode Patterns in Arc Discharge Simulations*”, Plasma Sources Science and Technology (2013) Vol. 22, No. 2, 025017. DOI: [10.1088/0963-0252/22/2/025017](https://doi.org/10.1088/0963-0252/22/2/025017)
- [9] **J. P. Trelles**, “*Non-Equilibrium Thermal Plasma Jet Impinging on a Substrate*”, IEEE Transactions on Plasma Science (2011) Vol. 39, No. 11, pp. 2870-2871. DOI: [10.1109/TPS.2011.2153879](https://doi.org/10.1109/TPS.2011.2153879)
- [8] **J. P. Trelles**, C. Chazelas, A. Vardelle and J. V. R. Heberlein, “*Arc Plasma Torch Modeling*”, Journal of Thermal Spray Technology (2009) Vol. 18, No. 5/6, pp. 728-752. DOI: [10.1007/s11666-009-9342-1](https://doi.org/10.1007/s11666-009-9342-1)
- [7] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Thermal Non-Equilibrium Simulation of an Arc Plasma Jet*”, IEEE Transactions on Plasma Science (2008) Vol. 36, No. 4, pp. 1026-1027. DOI: [10.1109/TPS.2008.922422](https://doi.org/10.1109/TPS.2008.922422)
- [6] **J. P. Trelles**, J. V. R. Heberlein, and E. Pfender, “*The Reattachment Process in Non-Equilibrium Arc Simulations*”, IEEE Transactions on Plasma Science (2008) Vol. 36, No. 4, pp. 1024-1025. DOI: [10.1109/TPS.2008.922420](https://doi.org/10.1109/TPS.2008.922420)
- [5] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Non-Equilibrium Modeling of Arc Plasma Torches*”, Journal of Physics D: Applied Physics (2007) Vol. 40, No. 19, pp. 5937-5952. DOI: [10.1088/0022-3727/40/19/024](https://doi.org/10.1088/0022-3727/40/19/024)
Research Highlight of the Articles Published in 2007

- [4] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Modeling of the Arc Reattachment Process in Plasma Torches*”, Journal of Physics D: Applied Physics (2007) Vol. 40, No. 18, pp. 5635-5648. DOI: [10.1088/0022-3727/40/18/019](https://doi.org/10.1088/0022-3727/40/18/019)
- [3] **J. P. Trelles** and J. V.R. Heberlein, “*Simulation Results of Arc Behavior in Different Plasma Spray Torches*”, Journal of Thermal Spray Technology (2006) Vol. 15, pp. 563-569. DOI: [10.1361/105996306X147252](https://doi.org/10.1361/105996306X147252)
- [2] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Multiscale Finite Element Modeling of Arc Dynamics in a DC Plasma Torch*”, Plasma Chemistry and Plasma Processing (2006) Vol. 26, pp. 557-575. DOI: [10.1007/s11090-006-9023-5](https://doi.org/10.1007/s11090-006-9023-5)
- [1] **J. P. Trelles** and J. J. Duffy, “*Numerical Simulation of Porous Latent Heat Thermal Energy Storage for Thermoelectric Cooling*”, Applied Thermal Engineering (2003) Vol. 23, pp. 1647-1664. DOI: [10.1016/S1359-4311\(03\)00108-X](https://doi.org/10.1016/S1359-4311(03)00108-X)

C.2.b. Other Archival Journal Content

- [1] **J. P. Trelles**, *Cover figure - Special Issue: Numerical Modeling of Low-Temperature Plasmas for Various Applications*, Plasma Processes and Polymers (2017), Vol. 14, No. 1-2. DOI: [10.1002/ppap.201770001](https://doi.org/10.1002/ppap.201770001)

C.2.d. Refereed Conference Proceedings and Symposium Papers

- [36] **J. P. Trelles**, “*Advances and Challenges in Modeling and Simulation of Thermal Plasma Flows*”, 15th International High-Tech Plasma Processes Conference (HTPP15), Toulouse, France, July 2 – 6, 2018.
Plenary speaker presentation
- [35] S. Mohsenian, **J. P. Trelles**, “*Microwave Plasma Reactor for Atmospheric-Pressure Carbon Dioxide Decomposition*”, 15th International High-Tech Plasma Processes Conference (HTPP15), Toulouse, France, July 2 – 6, 2018.
- [34] V. G. Bhigamudre, **J. P. Trelles**, “*Thermodynamic Nonequilibrium Effects in the Arc in Crossflow*”, 15th International High-Tech Plasma Processes Conference (HTPP15), Toulouse, France, July 2 – 6, 2018.
- [33] **J. P. Trelles**, “*Nonequilibrium Plasma Flows Simulations: Kinetics, Patterns, and Turbulence*”, 10th International Symposium on Advanced Plasma Science and its Applications for Nitrides and Nanomaterials / 11th International Conference on Plasma-Nano Technology & Science, Meijo University, Aichi, Japan, March 4 – 8, 2018.
Invited speaker presentation
- [32] S. M. Modir Khazeni, V. G. Bhigamudre, **J. P. Trelles**, “*Stability and Turbulence in Nonequilibrium Plasma Flow Simulations*”, 10th International Symposium on Advanced Plasma Science and its Applications for Nitrides and Nanomaterials / 11th International Conference on Plasma-Nano Technology & Science, Meijo University, Aichi, Japan, March 4 – 8, 2018.
- [31] D. Nagassou, S. Mohsenian, R. Elahi, **J. P. Trelles**, “*On the Potential for Enhancement of Solar Thermochemical Synthesis Processes by Nonequilibrium Plasma*”, Annual Meeting of the American Institute of Chemical Engineers (2017 AIChE Annual Meeting) - Symposium on Solar Power and Chemical Systems in Honor of Prof. Edward A. Fletcher, Minneapolis, Minnesota, Oct. 29 – Nov. 3, 2017.
- [30] S. Bhatta, **J. P. Trelles**, “*Reactor Design and Evaluation for the Solar Photo-Thermochemical Processing of Carbon Dioxide and Methane*”, Annual Meeting of the American Institute of Chemical Engineers (2017 AIChE Annual Meeting) - Symposium on Solar Power and Chemical Systems in Honor of Prof. Edward A. Fletcher, Minneapolis, Minnesota, Oct. 29 – Nov. 3, 2017.
- [29] S. M. Modir Khazeni, **J. P. Trelles**, “*Simulation of the Turbulent Flow from a Non-Transferred Arc Plasma Torch*”, 23rd International Symposium on Plasma Chemistry (ISPC 23), Montreal, Canada, July 30 – Aug. 4, 2017.
- [28] V. G. Bhigamudre, **J. P. Trelles**, “*Thermodynamic Nonequilibrium Simulation of an Arc in Crossflow*”, 23rd International Symposium on Plasma Chemistry (ISPC 23), Montreal, Canada, July 30 – Aug. 4, 2017.
- [27] **J. P. Trelles**, “*Advances and Challenges in Fluid Flow Models of Low-Temperature Plasmas*”, Special Session at: International Conference on Plasma Phenomena in Ionized Gases (ICPIG 2017), Estoril/Lisbon, Portugal, July 9 – 14, 2017.
Invited special session
- [26] S. M. Modir Khazeni, **J. P. Trelles**, “*Coarse-Grained Simulation Method for Turbulent Nonequilibrium Plasma Flows*”, International Conference on Plasma Phenomena in Ionized Gases (ICPIG 2017), Estoril/Lisbon, Portugal, July 9 – 14, 2017.
- [25] V. G. Bhigamudre, **J. P. Trelles**, “*Variational Multiscale Finite Element Simulation of a Nonequilibrium*

- Atmospheric-Pressure Arc in Crossflow*”, IEEE 44th International Conference on Plasma Science, Atlantic City, New Jersey, USA, May 21 – 25, 2017.
- [24] **J. P. Trelles**, “*Modeling and Simulation of Nonequilibrium Atmospheric Pressure Plasma Flows*”, American Vacuum Society AVS 63rd International Symposium & Exhibition, Nashville, TN, Nov. 6 – 11, 2016.
- Invited speaker presentation**
- [23] S. M. Modir Khazeni, **J. P. Trelles**, “*Preliminary Results of a Consistent and Complete Approach for the Coarse-Grained Simulation of Turbulent Nonequilibrium Plasmas*”, Gordon Research Conference on Plasma Processing Science, Andover, New Hampshire, July 24 – 29, 2016.
- [22] **J. P. Trelles**, “*Predictive Simulation of Pattern Formation and Self-Organization in Plasmas*”, Whitepaper - Plasma Self-Organization, Frontiers of Plasma Science Workshops, U.S. Department of Energy, Office of Science, Fusion Energy Sciences, June 2016.
- [21] C. Chazelas, A. Vardelle, **J. P. Trelles**, “*The Main Issues to Address in Modeling Plasma Spray Torch Operation*”, 2016 International Thermal Spray Conference (ITSC 2016), Shanghai, China, May 10 - 12, 2016.
- [20] M. Gautier, **J. P. Trelles**, V. Rohani, L. Fulcheri, “*Computational Study of Carbon Nanoparticle Formation during Thermal Decomposition of Methane*”, 22nd International Symposium on Plasma Chemistry (ISPC 22), Antwerp, Belgium, July 5 – 10, 2015.
- [19] S. M. Modir Khazeni, **J. P. Trelles**, “*Towards a Comprehensive Modelling and Simulation Approach for Turbulent Nonequilibrium Plasma Flows*”, 22nd International Symposium on Plasma Chemistry (ISPC 22), Antwerp, Belgium, July 5 – 10, 2015.
- [18] **J. P. Trelles**, “*Simulation of Anode Pattern Formation in Arc Discharges*”, 22nd International Symposium on Plasma Chemistry (ISPC 22), Antwerp, Belgium, July 5 – 10, 2015.
- [17] S. Bhatta, D. Nagassou, **J. P. Trelles**, “*Direct Receiver-Reactor for Solar Photo-Thermochemical Processing*”, 2015 ASME Power & Energy Conference, ASME 2015 9th International Conference on Energy Sustainability, San Diego, California, June 28 – July 2, 2015.
- [16] M. Gautier, **J. P. Trelles**, V. Rohani, L. Fulcheri, “*Modélisation de la Formation des Nanoparticules de Carbone Pendant la Décomposition Thermique du Méthane*”, CAE XI-12^{ème} Colloque sur les Arcs Électriques, Clermont-Ferrand, France, March 18 – 19, 2015.
- [15] **J. P. Trelles**, “*Capturing Pattern Formation in Plasma Flow Simulations*”, Gordon Research Conference on Plasma Processing Science, Smithfield, Rhode Island, July 27 – Aug. 1, 2014.
- [14] R. O. Castro, **J. P. Trelles**, “*Analysis of Radiative Heat Transfer in Parabolic Solar Concentrators using a Spatial-Angular Finite Element Method*”, ASME 8th International Conference on Energy Sustainability, Boston, Massachusetts, June 30 – July 2, 2014.
- [13] S. Bhatta, D. Nagassou, **J. P. Trelles**, “*High-Flux Solar Simulator and Solar Photo-Thermal Reactor: Design and Analysis*”, ASME 8th International Conference on Energy Sustainability, Boston, Massachusetts, June 30 – July 2, 2014.
- [12] **J. P. Trelles**, “*Emergence of Self-Organized Patterns in Arc Discharges by Anode Cooling*”, IEEE 41st International Conference on Plasma Science, Washington DC, May 25 – 29, 2014.
- Invited oral presentation**
- [11] **J. P. Trelles**, “*Simulating the Spontaneous Formation of Self-Organized Anode Spot Patterns in Arc Discharges*”, APS 66th Gaseous Electronics Conference, Princeton, New Jersey, Sept. 30 – Oct. 4, 2013.
- [10] **J. P. Trelles**, “*Flow Dynamics from a Nonequilibrium Atmospheric-Pressure Arc Discharge Jet*”, APS 66th Gaseous Electronics Conference, Princeton, New Jersey, Sept. 30 – Oct. 4, 2013.
- [9] R. A. Arakoni, **J. P. Trelles**, D. Kim, M. Khabibullin, S. Nikonov, and D. Zierath, “*Feature-Scale Modeling of Diffusion Barrier and Metal Seed Physical Vapor Deposition Processes*”, AVS 58th International Symposium & Exhibition, Oct. 30 – Nov. 4, 2011.
- [8] **J. P. Trelles** and S. S. Liao, “*Fluid Flow Effects in ALD for Semiconductor Manufacturing*”, 11th International Conference on Atomic Layer Deposition, Cambridge, Massachusetts, June 26-29, 2011, Proceedings p. 84.
- [7] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Three-Dimensional Time-Dependent Non-Equilibrium Modeling of Arc and Jet Dynamics in DC Plasma Torches*”, IEEE 35th International Conference on Plasma Science, Karlsruhe, Germany, June 15 – 19, 2008.
- [6] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Comparison Between Non-Equilibrium and Equilibrium Modeling Results of an Arc Plasma Torch*”, American Physical Society (APS) 60th Gaseous Electronics Conference, Arlington, Virginia, Oct. 2 – 5, 2007, Proceedings p.6.

Student Excellence Award Finalist

- [5] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Finite Element Modeling of the Arc Reattachment Process in DC Plasma Torches*”, IEEE Pulsed Power and Plasma Science Conference, Albuquerque, New Mexico, June 17–22, 2007, Proceedings p. 81.
- [4] J. V. R. Heberlein, **J. P. Trelles**, D. Outcalt, M. Hallberg, P. Strykowski, E. Pfender, “*Control of Fluid Dynamic Instabilities in Plasma Torches – Key to Reproducible Atmospheric Pressure Plasma Spray Coatings*”, 10th International Conference on Plasma Surface Engineering, Garmisch-Partenkirchen, Germany, Sept. 10 – 15, 2006.
- [3] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*3D Finite Element Modeling of Arc and Jet Dynamics in a DC Plasma Torch*”, APS 59th Gaseous Electronics Conference, Columbus, Ohio, Oct. 10 – 13, 2006, Proceedings p. 45.
- [2] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Three-Dimensional Finite Element Modeling of Dynamic Arc Behavior in a DC Plasma Torch*”, IEEE International Conference on Plasma Science, Traverse City, Michigan, June 4 – 8, 2006, Proceedings p. 277.
- [1] **J. P. Trelles** and J. V. R. Heberlein, “*Simulation Results of Arc Behavior in Different Plasma Spray Torches*”, ASM International Thermal Spray Conference & Exposition, Seattle Washington, May 15 – 18, 2006.

C.2.e. Contributed Conference, Symposium, and Workshop Presentations (Oral)*

* All accompanied by a paper, see: refereed conference proceeding and symposium papers

- [26] **J. P. Trelles**, “*Frontiers in Computational Plasma Flow Modeling: Capturing Nonequilibrium*”, Gordon Research Conference on Plasma Processing Science, Smithfield, Rhode Island, Aug. 5 – 10, 2018.
- Invited speaker presentation**
- [25] **J. P. Trelles**, “*Advances and Challenges in Modeling and Simulation of Thermal Plasma Flows*”, 15th International High-Tech Plasma Processes Conference (HTPP15), Toulouse, France, July 2 – 6, 2018.
- Plenary speaker presentation**
- [24] Sen-Hui Liu, Cheng-Xin Li, Chang-Jiu Li, **J. P. Trelles**, Anthony B. Murphy, “*Development of A Novel Long Laminar Plasma Jet on Thermal Spraying Process: Microstructure Evolution of YSZ Coatings*”, International Thermal Spray Conference And Exposition 2018, Orlando, Florida, Aug. 7 – 10, 2018.
- [23] **J. P. Trelles**, “*Nonequilibrium Plasma Flows Simulations: Kinetics, Patterns, and Turbulence*”, 10th International Symposium on Advanced Plasma Science and its Applications for Nitrides and Nanomaterials / 11th International Conference on Plasma-Nano Technology & Science, Meijo University, Aichi, Japan, March 4 – 8, 2018.
- Invited speaker presentation**
- [22] D. Nagassou, S. Mohsenian, R. Elahi, **J. P. Trelles**, “*On the Potential for Enhancement of Solar Thermochemical Synthesis Processes by Nonequilibrium Plasma*”, Annual Meeting of the American Institute of Chemical Engineers (2017 AIChE Annual Meeting) - Symposium on Solar Power and Chemical Systems in Honor of Prof. Edward A. Fletcher, Minneapolis, Minnesota, Oct. 29 – Nov. 3, 2017.
- [21] S. Bhatta, **J. P. Trelles**, “*Reactor Design and Evaluation for the Solar Photo-Thermochemical Processing of Carbon Dioxide and Methane*”, Annual Meeting of the American Institute of Chemical Engineers (2017 AIChE Annual Meeting) - Symposium on Solar Power and Chemical Systems in Honor of Prof. Edward A. Fletcher, Minneapolis, Minnesota, Oct. 29 – Nov. 3, 2017.
- [20] **J. P. Trelles**, “*Advances and challenges in fluid flow models of low-temperature plasmas*”, Special Session at: International Conference on Plasma Phenomena in Ionized Gases (ICPIG 2017), Estoril/Lisbon, Portugal, July 9 – 14, 2017.
- Invited special session presentation**
- [19] V. G. Bhigamudre, **J. P. Trelles**, “*Variational Multiscale Finite Element Simulation of a Nonequilibrium Atmospheric-Pressure Arc in Crossflow*”, IEEE 44th International Conference on Plasma Science, Atlantic City, New Jersey, USA, May 21 – 25, 2017.
- [18] **J. P. Trelles**, “*Modeling and Simulation of Nonequilibrium Atmospheric Pressure Plasma Flows*”, American Vacuum Society AVS 63rd International Symposium & Exhibition, Nashville, TN, Nov. 6 – 11, 2016.
- Invited speaker presentation**
- [17] **J. P. Trelles**, “*Predictive Simulation of Pattern Formation and Self-Organization in Plasma*”, whitepaper - Plasma Self-Organization, Frontiers of Plasma Science Workshops, U.S. Department of Energy, Office of Science, Fusion Energy Sciences, June 2016.

- [16] C. Chazelas, A. Vardelle, **J. P. Trelles**, “*The Main Issues to Address in Modeling Plasma Spray Torch Operation*”, 2016 International Thermal Spray Conference (ITSC 2016), Shanghai, China, May 10 – 12, 2016.
- [15] S. Bhatta, D. Nagassou, **J. P. Trelles**, “*Direct Receiver-Reactor for Solar Photo-Thermochemical Processing*”, 2015 ASME Power & Energy Conference, ASME 2015 9th International Conference on Energy Sustainability, San Diego, California, June 28 – July 2, 2015.
- [14] R. O. Castro, **J. P. Trelles**, “*Analysis of Radiative Heat Transfer in Parabolic Solar Concentrators using a Spatial-Angular Finite Element Method*”, ASME 8th International Conference on Energy Sustainability, Boston, Massachusetts, June 30 – July 2, 2014.
- [13] S. Bhatta, D. Nagassou, **J. P. Trelles**, “*High-Flux Solar Simulator and Solar Photo-Thermal Reactor: Design and Analysis*”, ASME 8th International Conference on Energy Sustainability, Boston, Massachusetts, June 30 – July 2, 2014.
- [12] **J. P. Trelles**, “*Emergence of Self-Organized Patterns in Arc Discharges by Anode Cooling*”, IEEE 41st International Conference on Plasma Science, Washington DC, May 25 – 29, 2014.

Invited oral presentation

- [11] **J. P. Trelles**, “*Simulating the Spontaneous Formation of Self-Organized Anode Spot Patterns in Arc Discharges*”, APS 66th Gaseous Electronics Conference, Princeton, New Jersey, Sept. 30 – Oct. 4, 2013.
- [10] **J. P. Trelles**, “*Flow Dynamics from a Nonequilibrium Atmospheric-Pressure Arc Discharge Jet*”, APS 66th Gaseous Electronics Conference, Princeton, New Jersey, Sept. 30 – Oct. 4, 2013.
- [9] R. A. Arakoni, **J. P. Trelles**, D. Kim, M. Khabibullin, S. Nikonov, and D. Zierath, “*Feature-Scale Modeling of Diffusion Barrier and Metal Seed Physical Vapor Deposition Processes*”, AVS 58th International Symposium & Exhibition, Oct. 30 – Nov. 4, 2011.
- [8] **J. P. Trelles** and S. S. Liao, “*Fluid Flow Effects in ALD for Semiconductor Manufacturing*”, 11th International Conference on Atomic Layer Deposition, Cambridge, Massachusetts, June 26 – 29, 2011, Proceedings p. 84.
- [7] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Three-Dimensional Time-Dependent Non-Equilibrium Modeling of Arc and Jet Dynamics in DC Plasma Torches*”, IEEE 35th International Conference on Plasma Science, Karlsruhe, Germany, June 15 – 19, 2008.
- [6] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Comparison Between Non-Equilibrium and Equilibrium Modeling Results of an Arc Plasma Torch*”, American Physical Society (APS) 60th Gaseous Electronics Conference, Arlington, Virginia, Oct. 2 – 5, 2007, Proceedings p.6.

Student Excellence Award Finalist

- [5] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Finite Element Modeling of the Arc Reattachment Process in DC Plasma Torches*”, IEEE Pulsed Power and Plasma Science Conference, Albuquerque, New Mexico, June 17 – 22, 2007, Proceedings p. 81.
- [4] J. V. R. Heberlein, **J. P. Trelles**, D. Outcalt, M. Hallberg, P. Strykowski, E. Pfender, “*Control of Fluid Dynamic Instabilities in Plasma Torches – Key to Reproducible Atmospheric Pressure Plasma Spray Coatings*”, 10th International Conference on Plasma Surface Engineering, Garmisch-Partenkirchen, Germany, Sept. 10 – 15, 2006.
- [3] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*3D Finite Element Modeling of Arc and Jet Dynamics in a DC Plasma Torch*”, APS 59th Gaseous Electronics Conference, Columbus, Ohio, October 10 – 13, 2006, Proceedings p. 45.
- [2] **J. P. Trelles**, E. Pfender and J. V. R. Heberlein, “*Three-Dimensional Finite Element Modeling of Dynamic Arc Behavior in a DC Plasma Torch*”, IEEE International Conference on Plasma Science, Traverse City, Michigan, June 4 – 8, 2006, Proceedings p. 277.
- [1] **J. P. Trelles** and J. V. R. Heberlein, “*Simulation Results of Arc Behavior in Different Plasma Spray Torches*”, ASM International Thermal Spray Conference & Exposition, Seattle, Washington, May 15 – 18, 2006.

C.2.f. Contributed Conference and Symposium Posters*

* All accompanied by a paper, see: refereed conference proceeding and symposium papers

- [20] S. Mohsenian, **J. P. Trelles**, “*Development of a microwave plasma-enhanced solar reactor for atmospheric-pressure gas phase chemical synthesis*”, Gordon Research Conference on Plasma Processing Science, Smithfield, Rhode Island, Aug. 5 – 10, 2018, *to appear*.
- [19] V. G. Bhigamudre, **J. P. Trelles**, “*Investigations of Flow Regimes in the Arc in Crossflow*”, Gordon Research Conference on Plasma Processing Science, Smithfield, RI, Aug. 5 – 10, 2018, *to appear*.
- [18] V. G. Bhigamudre, **J. P. Trelles**, “*Thermodynamic Nonequilibrium Effects in the Arc in Crossflow*”, 15th

- International High-Tech Plasma Processes Conference (HTPP15), Toulouse, France, July 2 – 6, 2018.
- [17] S. Mohsenian, **J. P. Trelles**, “*Microwave Plasma Reactor for Atmospheric-Pressure Carbon Dioxide Decomposition*”, 15th International High-Tech Plasma Processes Conference (HTPP15), Toulouse, France, July 2 – 6, 2018, *to appear*.
- [16] V. G. Bhigamudre, S. M. Modir Khazeni, **J. P. Trelles**, “*Stability and Turbulence in Nonequilibrium Plasma Flow Simulations*”, 10th International Symposium on Advanced Plasma Science and its Applications for Nitrides and Nanomaterials / 11th International Conference on Plasma-Nano Technology & Science, Meijo University, Aichi, Japan, March 4 – 8, 2018.
Best poster award
- [15] S. M. Modir Khazeni, **J. P. Trelles**, “*Simulation of the Turbulent Flow from a Non-Transferred Arc Plasma Torch*”, 23rd International Symposium on Plasma Chemistry (ISPC 23), Montreal, Canada, July 30 – Aug. 4, 2017.
- [14] V. G. Bhigamudre, **J. P. Trelles**, “*Thermodynamic Nonequilibrium Simulation of an Arc in Crossflow*”, 23rd International Symposium on Plasma Chemistry (ISPC 23), Montreal, Canada, July 30 – Aug. 4, 2017.
- [13] S. M. Modir Khazeni, **J. P. Trelles**, “*Coarse-Grained Simulation Method for Turbulent Nonequilibrium Plasma Flows*”, International Conference on Plasma Phenomena in Ionized Gases (ICPIG 2017), Estoril/Lisbon, Portugal, July 9 – 14, 2017.
- [12] S. M. Modir Khazeni, **J. P. Trelles**, “*Coarse-Grained Variational Multiscale Approach for Nonlinear Transport Problems: from Incompressible to Turbulent Plasma Flows*”, HPC Day 2017, University of Massachusetts Dartmouth, Dartmouth, MA, May 25, 2017.
- [11] V. G. Bhigamudre, **J. P. Trelles**, “*Thermodynamic Nonequilibrium Model of Arc Plasma in Crossflow*”, HPC Day 2017, University of Massachusetts Dartmouth, Dartmouth, MA, May 25, 2017.
- [10] D. Nagassou, S. Mohsenian, S. Bhatta, **J. P. Trelles**, “*Solar-Plasma Reactor: Characterization and Design*”, 2017 Fulbright Enrichment Seminar on *Climatic Impacts*, May 17 – 21, Denver, CO.
- [9] S. M. Modir Khazeni, **J. P. Trelles**, “*Preliminary Results of a Consistent and Complete Approach for the Coarse-Grained Simulation of Turbulent Nonequilibrium Plasmas*”, Gordon Research Conference on Plasma Processing Science, Andover, NH, July 24 – 29, 2016.
- [8] S. M. Modir Khazeni, **J. P. Trelles**, “*Comprehensive Coarse-Grained Simulation Method for Turbulent Nonequilibrium Plasma Flows*”, HPC Day 2016, University of Massachusetts Dartmouth, Dartmouth, MA, May 17, 2016.
Best Poster Award
- [7] S. M. Modir Khazeni, **J. P. Trelles**, “*Comprehensive Coarse-Grained Simulation Method for Turbulent Nonequilibrium Plasma Flows*”, 19th Annual student Research Symposium, University of Massachusetts Lowell, Lowell, MA, April 19, 2016.
- [6] **J. P. Trelles**, “*Coarse-Grained Modeling and Simulation of Turbulent Plasma Flows*”, whitepaper - Turbulence and transport, Frontiers of Plasma Science Workshops, U.S. Department of Energy, Office of Science, Fusion Energy Sciences, June 2016.
- [5] M. Gautier, **J. P. Trelles**, V. Rohani, L. Fulcheri, “*Computational Study of Carbon Nanoparticle Formation during Thermal Decomposition of Methane*”, 22nd International Symposium on Plasma Chemistry (ISPC 22), Antwerp, Belgium, July 5 – 10, 2015.
- [4] S. M. Modir Khazeni, **J. P. Trelles**, “*Towards a Comprehensive Modelling and Simulation Approach for Turbulent Nonequilibrium Plasma Flows*”, 22nd International Symposium on Plasma Chemistry (ISPC 22), Antwerp, Belgium, July 5 – 10, 2015.
- [3] **J. P. Trelles**, “*Capturing Pattern Formation in Plasma Flow Simulations*”, Gordon Research Conference on Plasma Processing Science, Smithfield, RI, July 27 – Aug. 1, 2014.
- [2] S. Bhatta, D. Nagassou, R. O. Castro, **J. P. Trelles**, “*SOLAR Chemical Synthesis: From CO₂ to Fuels*”, 17th Annual student Research Symposium, University of Massachusetts Lowell, Lowell, MA, April 22, 2014.
Best Poster Award
- [1] **J. P. Trelles**, “*Non-thermal Gasification of Biomass and Urban Waste*”, Global CleanTech Meet-Up, Boston & Cambridge, Massachusetts, Oct. 15 – 18, 2012.

C.2.g. Invited Technical Presentations (Without Publication)

- [12] **J. P. Trelles**, “*Finite Element Methods for Nonequilibrium Plasma Flows: Advanced & Challenges*”, Department of Mechanical Engineering, Worcester Polytechnic Institute (WPI), Worcester, Massachusetts, January 19, 2018.
- [11] **J. P. Trelles**, “*Computational Fluid Modeling of Plasma Flows: Advances and Challenges*”, High Temperature and

- Plasma Laboratory, Department of Mechanical Engineering, University of Minnesota, Minneapolis, Minnesota, Oct. 30, 2017.
- [10] **J. P. Trelles**, “*Modeling & Simulation of Nonequilibrium Thermal Plasma Flows. Part I: Methodologies and Applications. Part II: Research Frontiers*”, State Key Laboratory of Electrical Insulation and Power Equipment, School of Electrical Engineering, Xi'an Jiaotong University, Xi'an, 710049, Shaanxi, China, March 17 – 23, 2016.
- [9] **J. P. Trelles**, “*Simulation of Non-Equilibrium Flows: Plasma Turbulence and Radiation Transport*”, UMass High Performance Computing Day (UMass HPC Day), UMass Dartmouth, Dartmouth, Massachusetts, Nov. 14, 2014.
- [8] **J. P. Trelles**, “*Frontiers in Computational Plasma Modeling: Turbulence and Radiation*”, Center for Atmospheric Research, University of Massachusetts Lowell, Lowell, Massachusetts, Oct. 18, 2013.
- [7] **J. P. Trelles**, “*Arc Dynamics in Plasma Torches*”, Symposium on Plasma Science and Technology in Honor of Professor Joachim V. R. Heberlein, University of Minnesota, Minneapolis, Minnesota, March 8, 2013.
- [6] **J. P. Trelles**, “*Multi-Scale Methods for Plasma Simulation*”, Center for Atmospheric Research, University of Massachusetts Lowell, Lowell, Massachusetts, Sept. 28, 2012.
- [5] **J. P. Trelles**, “*Atomic Layer Deposition in Semiconductor Manufacturing*”, Department of Mechanical Engineering, University of Washington, Vancouver, Washington, Nov. 7, 2011.
- [4] **J. P. Trelles**, “*Understanding Clean Energy: From Non-Equilibrium Thermodynamics to Sustainable Design*”, Department of Mechanical Engineering, University of Massachusetts, Lowell, Massachusetts, May 20, 2011.
- [3] **J. P. Trelles**, “*Finite Element Modeling of Thermal Plasma Flows*”, Process Technology Modeling, Intel Corporation, Hillsboro, Oregon, Aug. 3, 2007.
- [2] **J. P. Trelles**, “*Stabilized Finite Element Modeling of Plasma Flow Instabilities*”, Computer Science Research Institute (CSRI), Sandia National Laboratories, Albuquerque, New Mexico, Dec. 7, 2006.
- [1] **J. P. Trelles**, “*Service-Learning in Action: The PerUML Project*”, Department of Mathematics, Augsburg College, Minneapolis, Minnesota, Oct. 12, 2005.

D. INSTRUCTION RELATED ACTIVITY

D.1. Courses Taught

Undergraduate Lectures:

Thermodynamics

Code: MECH.2420 (22.242); Credits: 3; Terms: Spring 2013-2015; Fall 2014-2018

Design of Thermo-Fluid Systems

Code: MECH.4420 (22.442); Credits: 3; Terms: Fall 2014

Undergraduate Recitations:

Capstone Design

Code: MECH.4230 (22.423); Credits: 3; Terms: Spring 2013-2015, 2017, 2018

Engineering Capstone Design Project

Code: ENG.4010 (25.401); Credits: 3; Terms: Fall 2017-Spring 2018

Special Topics in Thermo-Fluids

Code: MECH.6020 (22.602); Credits: 3; Terms: Fall 2013

Mechanical Engineering Project III

Code: MECH.4000 (22.400); Credits: 3; Terms: Spring 2017

Graduate Lectures:

Transport Processes in Energy Systems

Code: MECH.5260 (22.526); Credits: 3; Terms: Spring 2014-2018

Energy Engineering Workshop

Code: MECH.5040 (22.504); Credits: 3; Terms: Fall 2012-2018

Graduate Recitations:

Doctoral Dissertation / Mechanical Engineering

Code: MECH.7590/7560/7530 (22.759/756/753); Credits: 9/6/3; Terms: Spring 2013-2017; Fall 2013-2016

Doctoral Dissertation / Energy Engineering

Code: ENGY.7590/7560/7530 (24.759/756/753); Credits: 9/6/3; Terms: Spring 2013-2016; Fall 2013-2015

Master's Thesis - Mechanical Engineering

Code: MECH.7460/7430 (22.746/743); Credits: 6/3; Terms: Spring 2016

Continued Graduate Research

Code: MECH.7610 (22.7610); Credits: 1; Terms: Spring 2014, 2017; Fall 2013-2014, 2016

D.2. Other Activity and Accomplishments Related to the Instructional Function

D.2.a. Graduate Student Advising

| Name | Degree | Thesis or Dissertation Title | Graduation |
|-------------------------------|-------------------------------------|--|------------------------------|
| <i>Doctoral</i> | | | |
| Mohsenian, Sina | <i>Ph.D. Mechanical Engineering</i> | <i>“Solar-Microwave Plasma Reactor for Gas Phase Chemical Synthesis”</i> | 2019 (anticipated) |
| Elahi, Rasool | <i>Ph.D. Mechanical Engineering</i> | <i>“Modeling and Simulation of Plasma – Solar Radiation Interaction”</i> | 2019 (anticipated) |
| Nagassou, Dassou | <i>Ph.D. Energy Engineering</i> | <i>“Solar-Gliding Arc Reactor for Gas Phase Chemical Synthesis”</i> | 2018 (anticipated) |
| Bhigamudre, Vyasraj G. | <i>Ph.D. Mechanical Engineering</i> | <i>“Thermodynamic Nonequilibrium Simulation of the Arc in Crossflow”</i> | 2018 (anticipated) |
| Bhatta, Saroj | <i>Ph.D. Energy Engineering</i> | <i>“Direct Receiver-Reactor for Solar Photo-Thermochemical Processing”</i> | Summer 2018 (anticipated) |
| Modir Khazeni, Seyedeh Mahnaz | <i>Ph.D. Mechanical Engineering</i> | <i>“Comprehensive Modeling Approach for Turbulent Nonequilibrium Plasma Flows”</i> | Dec. 2017 |
| Castro, Rafael O. | <i>Ph.D. Energy Engineering</i> | <i>“Spatial and Angular Finite Element Method for Radiative Transfer in Participating Media”</i> | Dec. 2014 |

| Masters | | | |
|------------------------------|------------------------------------|---|-------------|
| Sheth, Shyam | <i>M.S. Mechanical Engineering</i> | <i>“Design and Characterization of a Microwave Plasma Reactor for Carbon Dioxide Decomposition”</i> | Spring 2018 |
| Allihassan, Khaled | <i>M.S. Mechanical Engineering</i> | <i>“Design and Characterization of a Gliding Arc Reactor”</i> | Spring 2017 |
| Pereyra Boue, Maria Mercedes | <i>M.S. Energy Engineering</i> | <i>Non-thesis option</i> | Spring 2015 |

D.2.b. Visiting Scholar Advising

Hen-Sui Liu, *Ph.D. Materials Science and Engineering*, “*Computational Modeling of a Laminar Plasma Torch and its Application to Spraying Process*”, Xi'an Jiaotong University, Oct. 2017 – Oct. 2018

Maxime Gautier, *Ph.D. Mechanical Engineering*, Topic: “*Computational Study of Carbon Particle Formation during Thermal Decomposition of Methane*”, Paris Institute of Technology – MINES, May 2014 – Oct. 2014

D.2.c. Ph.D. Committee Member

UMass Lowell

Elaheh Noursadeghi, “*Distributed Fault Diagnosis for Networked Nonlinear Processes, Multi-Agent Systems, and Source Localization*”, Mechanical Engineering, May 2017.

Advisor: Ioannis Raptis

Milo DiPaola, “*Integral Methods for Wind Turbine and Wind Farm Modeling*”, Mechanical Engineering, Nov. 2015.

Advisor: Prof. David Willis

Iman Mirzaee Kakhki, “*Comprehensive Computational Investigation of Gallium Nitrite Ammonothermal Crystal Growth*”, Mechanical Engineering, Jan. 2015.

Advisor: Prof. Majid Charmchi

Shanthini Sachchithanathan, “*Optimal Window Glazing For Solar Buildings: Rethinking Rating Systems*”, Energy Engineering, May 2018 (expected).

Advisor: Prof. John Duffy

David Wojcicki, “*Flat Plate Solar Collector Model that Utilizes the Typical Day Concept to Predict Performance Output*”, Energy Engineering, April 2014.

Advisor: Prof. Robert Parkin

Walter Thomas, “*Energy Performance of Net-Zero and Near Net-Zero Energy Homes in New England*”, Energy Engineering, Nov. 2012.

Advisor: Prof. John Duffy

External

Daniel Burkat, “*Fundamental Investigation of the Restrike Process on an Electric Arc Anode*”, Ph.D. Chemical Engineering, McGill University, 2018 (expected).

Advisor: Prof. Sylvain Coulombe

Christophe Rehmert, “*Étude Théorique et Expérimentale d’une Torche Plasma Triphasée Associée à un Procédé de Gazéification de Matière Organique*”, Spécialité Énergétique et procédés, l’École nationale supérieure des mines de Paris (MINES ParisTech), Sept. 2013.

Advisor: Prof. Laurent Fulcheri

D.2.d. M.S. Committee Member

UMass Lowell

Sri Vignu Harsha Vardhan Gogulapati, “*High-Value Chemicals from Catalytic Pyrolysis of Chitin over Solid acid Catalysts*”, Chemical Engineering, Dec. 2017.

Advisor: Prof. Hsi-Wu Wong

Jacob Gardner, “*Thermal Hydraulic Modeling of the Mock Fuel Facility*”, Energy Engineering - Nuclear, Dec. 2015.

Advisor: Prof. John White

Josh Bevan, “*Vortex Dominated Flows: A High-Order, Conservative Eulerian Simulation Method*”, Mechanical Engineering, June 2015.

Advisor: Prof. David Willis

Abdoul Aziz Moussa Harouna, “*Review on Performance Assessment of Solar Assisted Heat Pumps Models for Domestic Hot Water Supply: A Case for Boston*”, Energy Engineering, University of Massachusetts Lowell, Aug. 2014.

Advisor: Prof. Robert Parkin

Ella Willard-Schmoe, “*Design, Construction and Assessment of a Residential Desiccant Dehumidification System Powered by Excess Solar Heat*”, Energy Engineering, Nov. 2013.

Advisor: Prof. John Duffy

Gerber Ramos, “*Field Testing Method for Photovoltaic Modules*”, Energy Engineering, Dec. 2012.

Advisor: Prof. John Duffy

Maria Benavente, “*Hybrid Dual-Wall Adobe House Design the Thermal Modeling and Design of an Optimized Hybrid Adobe, Post-And-Beam Home With Added Straw-Adobe Insulation*”, Energy Engineering, Dec. 2012.

Advisor: Prof. John Duffy

D.2.e. Undergraduate and Other Student Advising (Research)

UMass Lowell

Benjamin Balian, *Research Co-Op Scholar - Mechanical Engineering*: Summer 2017

Michael Welton, *Research Co-Op Scholar - Mechanical Engineering*: Summer 2017

Shyam Sheth, *Research Co-Op Scholar - Mechanical Engineering*: Summer 2014; *Volunteer - Mechanical Engineering*: Fall 2015-Spring 2016; *NSF REU Scholar*: Summer 2016; *Volunteer - Mechanical Engineering*: Fall 2016-Spring 2017

Kaila Greyley, *Volunteer - Chemical Engineering*: Fall 2015

Brendan Victor, *Research Co-Op Scholar - Mechanical Engineering*: Summer 2014

Charles Barbon, *Research Co-Op Scholar - Mechanical Engineering*: Summer 2013

Jacob Hulme, *Research Co-Op Scholar - Mechanical Engineering*: Summer 2013

External – High School

Tymon Nieduzak, *Senior - Acton Boxborough Regional High School*: Summer 2017

D.2.f. Undergraduate and Other Student Advising (Capstone)

UMass Lowell – Mechanical Engineering Department (MECH.4230, formerly 22.423)

Spring 2018, project: “*Renewable Energy Teaching Pod for Girls Inc. of Lowell*”; students: Katherine Elwell, Benjamin Tran

Spring 2018, project: “*Optical Diagnostics Equipment for Solar-Plasma Reactors*”; students: Tyler Reiss, John Scudder
Fall 2017 / Spring 2018 (Industrial Capstone with Axcelis Technologies Inc): project: “*Beam Tuning for Semiconductor Manufacturing*”; students: Samuel Slowinski, Amiel Reid, Lesa Duval, Sami Driss

Spring 2017, project: “*Chemical and Water-Free Disinfection via Non-Thermal Plasma*”; students: Shyam Sheth, Brandon Kee, Derek J. Lewis

Spring 2015, project: “*Plasma Pen*”; students: Khaled Ali Hassan, Hussien Haidar, Kevin Martin, Nicholas Randall

Spring 2014, project: “*Plasma Pen*”; students: Gabi Dagher, Caleb Valdes, Ramon Stevez, Sidney Ho

Spring 2013, project: “*Portable Plasma Gliding Arc*”; students: Nicholas Connell, Hans Muehlen, Steven Agostinelli, Edis Miljevic

E. SERVICE ACTIVITIES

E.1. Community Activities Related to Professional Field

E.1.a Professional Service

Frontiers of Plasma Science Workshops

August 2018

Plasma Processing Science (GRS) Gordon Research Seminar, Bryant University in Smithfield, RI, August 04-05, 2018

Speaker and discussion leader

- Guided discussion, summarized consensus, and wrote summary report for the focus application area: Energy and the Environment.

NSF Workshop August 2016

Science Challenges in Low Temperature Plasma Science and Engineering: Enabling a Future Based on Electricity through Non-Equilibrium Plasma Chemistry, National Science Foundation Headquarters, Washington D.C., August 22-23, 2016

Discussion leader

- Guided discussion, summarized consensus, and wrote summary report for the focus application area: Energy and the Environment.

Frontiers of Plasma Science Workshops June 2015

U.S. Department of Energy, Office of Science, Fusion Energy Sciences

Contributor

- Contributor of two white papers: “*Coarse-Grained Modeling and Simulation of Turbulent Plasma Flows*” and “*Predictive Simulation of Pattern Formation and Self-Organization in Plasmas*”.

E.1.b Professional Conferences Organized

Technical Session Chair July 2018

15th International High Tech Plasma Processes Conference (HTTP 15), Toulouse, France, July 2 - 6, 2018.

- Chaired the session: “Energy and Transport Applications”.

International Scientific Committee Member Feb. - July 2018

15th International High Tech Plasma Processes Conference (HTTP 15), Toulouse, France, July 2 - 6, 2018.

Technical Session Chair March 2018

10th International Symposium on Advanced Plasma Science and its Applications for Nitrides and Nanomaterials / 11th International Conference on Plasma-Nano Technology & Science, Meijo University, Aichi, Japan, March 4 – 8, 2018.

- Chaired the session: “Plasma Science 1”.

Technical Session Organizer May 2017

IEEE 44th International Conference on Plasma Science, Atlantic City, New Jersey, USA, May 21 – 25, 2017

Session Topic 1.2: Computational Physics and Techniques

- Organized 3 oral and 1 poster session.

E.2. Committee Activities

E.2.a University Level

University of Massachusetts Lowell

Massachusetts Green High Performance Computing Center 2012 – 2015, 2018 - present

Faculty representative

- Participated in one-hour bi-weekly meetings during Fall 2013 and Spring 2014, and one-and-a-half hour monthly meetings since Spring 2018.
- Tested MGHPCC computing resources; shared feedback with MGHPCC representatives; discussed software resources, usage policies (queuing, accounts, types of jobs).

E.2.b College Level

University of Massachusetts Lowell, Francis College of Engineering

Energy Engineering Minor Coordinator, College of Engineering 2013 – present

Coordinator and faculty advisor

- Advised engineering students on required courses and scope of a career in Energy Engineering.

College of Engineering Computing Committee 2012 – present

Member, representative to the Department of Mechanical Engineering

- Discussed computing teaching resources and issues within the College of Engineering.

Society of Hispanic Professional Engineers (SHPE) 2012 – present

Faculty advisor

- Together with (non-faculty) co-advisor Hector Valdez, re-established UMass Lowell's SHPE chapter.
- Coordinated the travel and participation of UMass Lowell Engineering students in the SHPE Regional Leadership Development Conferences (RLDCs) in 2014, 2015, 2016, and 2017; and the SHPE National Conference in 2013, 2014, and 2015.

University of Minnesota, Institute of Technology

Institute of Technology Instructional Computing Committee 2006 – 2007

Member, representative to the Department of Mechanical Engineering

- Discussed computing teaching resources and issues.

E.2.c Department Level

University of Massachusetts Lowell, Department of Mechanical Engineering

Department of Mechanical Engineering Faculty Search 2015 – 2016

Chair, Thermofluid Transport Search Committee

- Organized and distributed applications among committee members; reviewed all candidate applications; organized and chaired committee meetings; performed phone interviews and site interviews.
- Resulted in the successful hiring of one faculty member.

Universidad Nacional de Ingeniería, Departamento de Ingeniería Mecánica

Mechanical Engineering Department Council 2015 – 2016

Student member

- Discussed teaching and governance issues affecting the department and the student body.

E.3. Outreach Activities

Lowell High School (Lowell, MA) March 21, 2017

Lowell High School Clean Energy Program

Speaker

- Prepared and presented the talk: “*Introduction to Solar Energy Science and Technology*” to approximately 20 senior high school students to promote careers in the renewable energy field.

Society of Hispanic Professional Engineers (SHPE) Oct. 2010 and Feb. 2012

Organizer and participant

- “Una Noche de Ciencias” event to promote science and engineering careers in middle school students and their parents; presented at Evergreen Middle School, Hillsboro, OR (Oct. 2010), South Meadows Middle School, Hillsboro, OR (Feb. 2012).

Augsburg College (Minneapolis, MN) Oct. 12, 2005

Department of Mathematics

Speaker

- Presented the talk: “*Service-Learning in Action: The PerUML Project*” to approx. 20 undergraduate students to promote the Village Empowerment Project and Service-Learning with math and science careers.

Village Empowerment Project (Huarmey, Ancash – Perú) 2001 – 2003

Participant

- Service-Learning project directed by Prof. John Duffy (UMass Lowell) aimed to improve living conditions of people in remote Peruvian villages through the use of sustainable energy technology. Worked directly with faculty, students, volunteers and villagers in the design, fabrication, installation, and training of photovoltaic, hydroelectric, and biomass systems in medical clinics, schools, and town halls for vaccine refrigeration, lightings, radio communication, education, and computer use.