LALIT PATIDAR

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EDUCATION

Penn State University, University Park, PA *August 2015 - December 2019 (expected)*
Ph.D., Mechanical Engineering GPA: 4.00/4.00

Indian Institute of Technology Bombay, Mumbai, India *August 2010 - July 2015*
Dual Degree (Bachelor and Master of Technology), Mechanical Engineering GPA: 8.73/10.0
Minor in Aerospace Engineering

EXPERIENCE

Graduate Research Assistant *August 2015 - Present*
Mechanical Engineering, Penn State University
Advisor: Dr. Stefan Thynell

- Performed quantum mechanics calculations to develop a detailed reaction mechanism for thermal decomposition of energetic materials
- Applied TGA-FTIR experimental technique and kinetic modeling to validate the reaction mechanism
- Developed a transport properties database for combustion modeling of energetic materials using high-level ab initio quantum mechanics calculations
- Predicted the burn-rate and flame structure of RDX and HMX using a multi-phase combustion model

Graduate Research Assistant *July 2014 - July 2015*
Mechanical Engineering, Indian Institute of Technology Bombay
Advisor: Dr. Arindrajit Chowdhury

- Developed a lab-scale rocket propulsion research facility to characterize high energy density materials
- Designed and performed experiments to quantify thrust and chamber pressure of novel propellants
- Implemented discrete phase model for liquid propellant spray and combustion using ANSYS FLUENT

Project Manager *July 2013 - July 2014*
IIT Bombay Racing, Formula SAE team

- Headed a team of 60 students on collaborative projects in automobile engineering as demonstrated by successful participation in BAJA SAE competition in India and Formula Student competition in UK
- Won several awards worth 2500 at the Formula Student competition in Silverstone, UK

Design Engineer *April 2013 - July 2013*
Tata Power Solar Systems Ltd., Bangalore, India

- Designed innovative solar products by extensive application of CFD and FEA simulations
- Performed Failure Modes and Effects Analysis (FMEA) to ensure product reliability

Visiting Research Student *May 2012 - July 2012*
Cranfield University at The Defence Academy of UK, Shrivenham, UK
Advisor: Prof. Amer Hameed

- Formulated a novel method to evaluate thrust on threaded end caps of military tanks
- Applied FEA simulation skills to increase the thrust capacity of screw breech in military tanks

JOURNAL ARTICLES - PUBLISHED

1. Khichar, M., Patidar, L.and Thynell, S.T., (2019). Comparative analysis of vaporization and thermal decomposition of cyclotrimethylenetrinitramine (RDX). ***Journal of Propulsion and Power***. (Accepted)
2. **Patidar, L.**, Khichar, M. and Thynell, S. T. (2019). Intermolecular potential parameters for transport property modeling of energetic organic molecules. ***Combustion and Flame***, 200, 232-241.
3. **Patidar, L.**, Khichar, M. and Thynell, S.T. (2018). Identification of initial decomposition reactions in liquid-phase HMX using quantum mechanics calculations. ***Combustion and Flame***, 188, 170-179.
4. Khichar, M., **Patidar, L.** and Thynell, S.T. (2018). Improvement and validation of a detailed reaction mechanism for thermal decomposition of RDX in liquid phase. ***Combustion and Flame***, 198, 455-465.
5. **Patidar, L.** and Thynell, S.T. (2017). Quantum mechanics investigation of initial reaction pathways and early ring-opening reactions in thermal decomposition of liquid-phase RDX. ***Combustion and Flame***, 178, 7-20.
6. Shaikh, T., **Patidar, L.** and Chowdhury, A. (2017). Experimental and numerical investigation of combustion in a hydrocarbon and gaseous oxygen fuelled rocket. ***Applied Thermal Engineering***, 110, 1554-1567.

JOURNAL ARTICLES - UNDER REVIEW/IN PREPARATION

1. **Patidar, L.**, Khichar, M. and Thynell, S.T. (2019). A three-phase model for steady-state deflagration of HMX with detailed liquid-phase kinetics. (In preparation).
2. **Patidar, L.**, Khichar, M. and Thynell, S.T. (2019). A Comprehensive Mechanism for Liquid-phase Decomposition of 1,3,5,7-Tetranitro-1,3,5,7-tetrazoctane (HMX): Thermolysis Experiments and Detailed Kinetic Modeling. ***Combustion and Flame***.(Under Review)

CONFERENCE PRESENTATIONS

1. **Patidar, L.**, Khichar, M. and Thynell, S.T. Modeling of HMX monopropellant combustion with detailed condensed-phase kinetics. AIAA Propulsion and Energy Forum, August 2019, Indianapolis, IN.
2. Khichar, M., **Patidar, L.** and Thynell, S.T. Comparative analysis of vaporization and thermal decomposition of cyclotrimethylenetrinitramine (RDX). AIAA Propulsion and Energy Forum, August 2019, Indianapolis, IN.
3. **Patidar, L.**, Khichar, M. and Thynell, S.T. Confined rapid thermolysis and chemical kinetic modeling of HMX decomposition in the liquid phase. JANNAF 49th Combustion Subcommittee meeting, June 2019, Dayton, OH.
4. **Patidar, L.**, Khichar, M. and Thynell, S.T. Thermogravimetric analysis and chemical kinetic modeling of HMX decomposition in the liquid phase. 11th US National Combustion Meeting, March 2019, Pasadena, CA.
5. Khichar, M., **Patidar, L.** and Thynell, S.T. Analysis of RDX monopropellant combustion wave structure using a model with detailed condensed-phase kinetics. 11th US National Combustion Meeting, March 2019, Pasadena, CA.

6. **Patidar, L.**, Khichar, M. and Thynell, S.T. Liquid-phase decomposition of RDX: Formation of Oxy-s-triazine and 1, 3, 4-oxadiazole. Spring Technical Meeting of the Eastern States Section of the Combustion Institute, March 2018, State College, PA.
7. Khichar, M., **Patidar, L.** and Thynell, S.T. Computational study of condensed-phase kinetics during combustion of pure RDX. Spring Technical Meeting of the Eastern States Section of the Combustion Institute, March 2018, State College, PA.
8. **Patidar, L.**, Khichar, M. and Thynell, S.T. A quantum mechanics study on early decomposition reactions for liquid-phase HMX. 10th US National Combustion Meeting, March 2017, University of Maryland, MD.
9. Khichar, M., **Patidar, L.** and Thynell, S.T. Computational analysis of RDX thermolysis in liquid state. 10th US National Combustion Meeting, March 2017, University of Maryland, MD.
10. **Patidar, L.** and Thynell, S.T. A quantum mechanics investigation for RDX ring-opening reactions. Spring Technical Meeting of the Eastern States Section of the Combustion Institute, March 2016, Princeton, NJ.
11. **Patidar, L.**, Shaikh, T. and Chowdhury, A. Numerical Simulation of Combustion in an n-Heptane and Gaseous Oxygen Rocket. 10th Asia Pacific Conference on Combustion, July 2015, Beijing, China.
12. Shaikh, T., **Patidar, L.** and Chowdhury, A. Experimental Characterization of a Gasoline-GOX Rocket. 10th Asia Pacific Conference on Combustion, July 2015, Beijing, China.
13. Maruvada, T., **Patidar, L.** and Patel, M. Thermal characterization of Lithium Polymer battery module for electric vehicle application. 2nd International Conference on Mechanical, Automotive and Materials Engineering, May 2014, Singapore.
14. **Patidar, L.** and Bhamidipati, S.R. Parametric Study of Drag Force on a Formula Student Electric Race Car Using CFD. 2nd International Conference on Mechanical, Automotive and Materials Engineering, May 2014, Singapore.

TEACHING EXPERIENCE AND OUTREACH

Teaching Assistant: Undergraduate Course on Thermodynamics *Spring 2015*
Department of Mechanical Engineering, IIT Bombay

· Designed and conducted tutorial sessions, evaluated course assignments and examinations
· Mentored a batch of 150 students, held office hours and provided personal attention to weak students

Teaching Assistant: Graduate Course on Communication Skills *Fall 2014*
Department of Mechanical Engineering, IIT Bombay

· Graded course assignments and quizzes, organized group discussions and class presentations

Academic Mentor *2014-2015*
Department of Mechanical Engineering, IIT Bombay

· Mentored academically under-performing senior students via one to one counselling

Student Advisor *2013-2014*
IIT Bombay Racing, Formula SAE Team

· Conceptualized research projects on vehicle aerodynamics and thermal management of lithium polymer battery for electric race car
· Mentored four undergraduate students; presented the work in an international conference in Singapore

Instructor *Winter 2013*
IIT Bombay Winter School

· Conducted workshops at institute level on SolidWorks, ANSYS and FLUENT for 50+ students

Activity Associate *2012-2013*
National Service Scheme, IIT Bombay

· Lead a team of 40 National Service Scheme volunteers for clothes collection campaign in IIT Bombay and donation to various NGOs

AWARDS AND ACHIEVEMENTS

- Merit-cum-Means scholarship by IIT Bombay for undergraduate studies (2010-2014)
- Institute Technical Special Mention by IIT Bombay for outstanding contribution to technical activities (awarded to 10 out of 7000 students) (2014)
- Summer Research Scholarship by Cranfield University, Shrivenham UK (2012)
- Certificate of Merit by CBSE (top 0.1 % nationwide) in senior school examination (2010)

TECHNICAL SKILLS

Experimental Tools	Thermal Analysis (TGA & DSC), FTIR spectroscopy
Software Tools	CHEMKIN/Cantera, SolidWorks, ANSYS, Gaussian, LAMMPS
Programming	C/C++, Python/Cython, MATLAB, FORTRAN

REFERENCES

Prof. Stefan Thynell
(PhD Dissertation Advisor)
Department of Mechanical Engineering, Penn State University
Address: 114 Research Building East
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Prof. Richard Yetter
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Address: 240 Research Building East
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Prof. Arindrajit Chowdhury
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