Praise Noah Johnson

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Thermodynamics and Combustion Engineering Laboratory, IIT Madras

Education

- **Indian Institute of Technology Madras** — Chennai, India
  Master of Science (by research) in Mechanical Engineering; CGPA:9/10 — *Jan '18 – Current*
- **Anna University Chennai (Maharaja Engineering College)** — Coimbatore, India
  Bachelor of Engineering in Mechanical Engineering; CGPA: 8.54/10 — *June '13 – Apr '17*

Research Experience

- **Oxidation kinetics of small methyl esters** — IIT Madras, India
  Advisor: Prof. Krithika Narayanaswamy — *Jan '18 - Current*
  - A combustion mechanism for methyl butanoate (a C_4 saturated ester) was chosen and the base chemistry (C_0-C_4) was updated.
  - High temperature kinetics for methyl crotonate (an unsaturated C_4 ester) was developed. The model predicts shock tube ignition delays and laminar flame speeds accurately.
  - Low temperature chemistry of methyl crotonate oxidation was developed and the kinetic model was validated using experimental data obtained using a rapid compression machine.
  - A surrogate fuel will be proposed for biodiesel using perviously investigated esters and n-dodecane. Further, it will be used to perform CFD calculations to predict the actual engine combustion – *Current*
  - **Skills acquired :** Combustion kinetic modeling, Model reduction, Engine CFD modeling, Perl scripting
- **Measurement of ignition delay times of MB-MC mixtures in RCM** — PTB, Germany
  Advisors: Prof. Ravi Fernandes and Dr. Bo Shu — *May '19 - June '19*
  - Ignition delay measurements were performed using a Rapid Compression Machine (RCM) in order to investigate the auto-ignition behavior of methyl buatnoate and methyl crotonate mixtures.
  - The experiments were used to investigate the low temperature kinetics of methyl esters and also to ascertain the importance of unsaturated esters in biodiesel.
  - **Challenges :** Preparation of mixtures without the esters condensing, due to their non-volatile nature.
  - **Skills acquired :** Auto-ignition experiments using RCM, Measurements of temperature and pressure
- **Performance study of cooling tower system in MTPS-1** — Mettur Thermal Power Station-1, India
  Advisor: Er. G. Sathish Kumar — *Feb '17 - April '17*
  - Study of cross-flow induced draft cooling tower was done by measuring the various thermodynamic parameters of the cooling tower.
  - An energy and efficiency analysis of the cooling tower was carried out and various losses, which resulted in increased feed-water pumping and reduced efficiency were identified.
  - Analytical relationships between various performance parameters and losses were identified and possible improvements to reduce losses in cooling towers were suggested.
  - **Skills acquired :** Energy and efficiency analysis of cooling towers

Research Output

- **P. N. Johnson**, K. Narayanaswamy, A Combined Kinetic Model for High-Temperature Oxidation of Methyl Crotonate, Methyl Butanoate and n-Dodecane as Components for Biodiesel Surrogate, 12th Asia-Pacific Conference on Combustion, Paper ASPACC2019-1466, 2019.
- S. K. Vallabhuni, **P.N. Johnson**, B. Shu, K. Narayanaswamy, R. X. Fernandes, Experimental and Kinetic Modeling Studies on the Auto-ignition of Methyl Crotonate at High Pressures and Intermediate Temperatures, Proceedings of the Combustion Institute, 38, 2020 (***Accepted***).

- **P. N. Johnson**, S. K. Vallabhuni, R. X. Fernandes, K. Narayanaswamy, A Comprehensive Chemical Kinetic Mechanism for Methyl Butanoate and Methyl Crotonate Combustion : Auto-ignition and Flames, ***(Manuscript under preparation - Combustion and Flame)***.

Technical Skills

- **Simulation tools:** FlameMaster, Chemkin Pro, Converge CFD
- **Programming languages:** C, C++, Perl
- **Other:** Linux, Microsoft Windows, LaTeX, MS Office

Teaching Experience

- **Teaching :** Teaching assistant for ME1100 - Thermodynamics. Course instructor: Dr. S. Varunkumar (IIT Madras, Fall 2019). Handled tutorial sessions, discussion hours and one lecture hour.
- **Mentoring:** Mentored three undergraduate students on their project titled 'Prediction of NO_x emissions using detailed kinetics' (August 2019 – November 2019).

Relevant Coursework

- **Fundamental courses:**
  - Air-breathing Engines (Spring 2018)
  - Fundamentals of Combustion (Fall 2018)
  - Applied Thermodynamics (Fall 2018)
  - Combustion Technology (Spring 2019)
  - Rocket Technology (Spring 2019)
- **Computational courses:**
  - Numerical Methods in Thermal Engineering (Spring 2018)
  - Computational Heat and Fluid Flow (Spring 2019)

Scholastic Achievements

- Received 'Inno-Indigo' project funding for a short-term research stay at Germany, May-June 2019.
- Received 'Half-Time Research Assistanship (HTRA)' from Ministry of Human Resource Development, Government of India to pursue MS (by research) at IIT Madras.
- Qualified 'Graduate Aptitude Test in Engineering (GATE 2017)' with an all India rank of 232 in 'Engineering Sciences'
- Placed 1^{st} in the Department of Mechanical Engineering, Maharaja Engineering College for the highest cumulative GPA (8.54/10) among a batch of 120 students in 2017.
- Titled as the 'Best Outgoing Student' of the year (2013-17 batch) in all-round category among all undergraduate students.
- Secured an all-India rank of 658 in 'Indian Engineering Olympiad 2015-16' and a city rank of 14.
- Qualified 'Joint Entrance Examination' (JEE Mains 2013) and was placed at 95^{th} percentile among 1.3 million test takers.

Test Scores

- **GRE :** 320/340; Verbal : 152/170, Quantitative : 168/170, Analytical Writing : 4.0
- **TOEFL :** 102

Other Interests

- **Arts:** Participated in solo-singing competitions from the age of seven and won many prizes.
- **Sports:** Badminton and chess enthusiast.