

Chad A. Baker

Curricula Vita
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Objective

Full-time position utilizing skills in modeling and experimentation to improve efficiency and reduce pollution associated with combustion.

Research Interests

Modeling mass, heat, and energy transport processes; combustion modeling; biofuel combustion; homogeneous charge compression ignition; gasoline direct injection; catalyst modeling; automotive powertrain optimization; heat exchanger optimization; waste heat recovery; validating models through experimentation

Important Coursework

Combustion Theory, Convection Heat Transfer, Multi-scale Flow and Transport Phenomena, Reacting Flows and Plasmas, Micro-scale Thermal Fluids Sciences, Molecular Gas Dynamics, Fundamentals of Heat and Mass Transfer, Fundamentals of Combustion, Fundamentals of Incompressible Flow, Internal Combustion Engines

Education

The University of Texas at Austin, Austin, TX USA

Ph.D., **Mechanical Engineering**, December 2012

Advisers: **Professor Matthew J. Hall** and **Professor Li Shi**

Area of Study: Thermal/Fluids Systems

GPA: 3.67/4.00

The University of Texas at Austin, Austin, TX USA

Master of Science, **Mechanical Engineering**, August 2009

Thesis Topic: *Vapor Transport Techniques for Growing Macroscopically Uniform Zinc Oxide Nanowires*

Advisers: **Professor Matthew J. Hall** and **Professor Li Shi**

Area of Study: Thermal/Fluids Systems

GPA: 3.46/4.00

Texas A&M University, College Station, TX USA

Bachelor of Science, **Mechanical Engineering**, May 2007

GPA: 3.23/4.00

Professional Experience

Graduate Research Assistant

The University of Texas at Austin, Austin, TX USA

October 2010 to Present

Thermoelectric diesel exhaust waste heat recovery to improve fuel efficiency

- Developed two dimensional thermoelectric device model with iterative coupling to heat exchanger model
- Designed heat exchanger experiment to test thermoelectric devices in Cummins engine exhaust

Graduate Research Assistant

The University of Texas at Austin, Austin, TX USA

January 2008 to Present

ZnO nanowires as novel catalyst substrate with analytical species transport model

- Developed two dimensional analytical model for catalyst species concentration
- Developed scalable method for chemical vapor transport ZnO nanowire growth
- Designed heterogeneous combustion reactor for testing species transport enhancement caused by ZnO nanowires

Graduate Technical Intern

Solvay Engineered Polymers, Mansfield, TX USA

May 2007 to August 2007

Polymer additives to increase durability of raw material for Ford King Ranch F-150 wheel flare

- Designed experiments to test additive migration and degradation in thermoplastics.
- Trained researchers to use lab equipment such as tensile testers and injection molders.
- Assisted other interns in Project Engineering with reducing production down time.

Project Engineering Intern

Solvay Engineered Polymers, Mansfield, TX USA

May 2006 to August 2006

Polymer manufacturing plant improvements

- Successfully designed improved cooling system for 3000 horsepower motors to prevent motor failures.
- Managed contractors for installation of improved lighting, safety equipment, and various structures to improve serviceability of polymer production lines.

Machinist

Texas A&M ECAE Lab, College Station, TX USA

June 2005 to August 2005

Machining in support of metallurgical research

- Planned and implemented machining processes to produce test billets from a raw round ingot.
- Assisted with construction of a custom annealing furnace.
- Assisted with operation of equal channel angular extruder.

Academic Experience

Grader

The University of Texas at Austin, Austin, TX USA

September 2001 to December 2001

Graded weekly assignments for ME 374C - Internal Combustion Engines

Teaching Assistant

The University of Texas at Austin, Austin, TX USA

September 2007 to December 2007

Teaching assistant for ME 139L - Heat Transfer Lab

- Led lab sessions
- Graded lab reports, quizzes, and tests
- Provided instruction on effective technical writing

Leadership and Service

Co-Director

Graduate and Industry Networking, The University of Texas at Austin

May 2009 to May 2010

- Established communication with engineers in industry to attend the networking event and provide funding.
- Secured funding for awards for poster session and paper competition.
- Secured facility for hosting the event.

Academic Career Seminar Series Director

Graduate Engineering Council (GEC), The University of Texas at Austin,

May 2011 to May 2012

Organized seminar series for preparing students for academic jobs

President

Graduate Engineering Council (GEC), The University of Texas at Austin,

Spring 2011

- Interfaced with university level student government
- Assisted other officers with their GEC projects
- Voiced concerns of GEC to Engineering Assistant Dean of Academic Affairs

Vice President

Graduate Engineering Council (GEC), The University of Texas at Austin,

Fall 2010

- Directed all GEC internal activities
- Assisted other officers with their GEC projects
- Rewrote student organization constitution to reflect GEC's actual duties

General Service

- Regular contributor to bug fixing and development of Scientific Python (SciPy) open source scientific computing package
- Refereed for First Lego League competitions to encourage children to be interested in science and engineering
- Demonstrated thermoelectric waste heat recovery research at Introduce a Girl to Engineering Day
- Demonstrated thermoelectric waste heat recovery research at Explore UT

Publications

C. Baker, A. O. Emiroglu, R. Mallick, O. Ezekoye, M. Hall, L. Shi., *Experimental and Modeling Study of Hydrocarbon Oxidation over Catalytic Surfaces of ZnO Nanowires and γ -Alumina*, in preparation.

C. Baker, L. Shi, M. Hall, *Simulation of Thermoelectric Module Heat Exchanger Performance in the Exhaust of a Medium-Duty Diesel Engine*, in review.

C. Baker, P. Vuppuluri, M. Hall, L. Shi., *Model of Heat Exchanger for Waste Heat Recovery from Diesel Engine Exhaust for Thermoelectric Power Generation*, accepted.

Presentations

Conferences

C. Baker, P. Vuppuluri, L. Shi, M. Hall, *Model of Heat Exchanger for Recovering Waste Heat from Diesel Engine Exhaust for Thermoelectric Power Generation*, ICT 2011, July 2011.

C. Baker, A. Osman Emiroglu, M. Hall, L. Shi, *ZnO Nanowires as a Novel Catalyst Substrate*, 22nd North American Catalysis Society Meeting, June 2011.

Invited

C. Baker, invited presentation: *ZnO Nanowires as a Novel Catalyst Substrate*, Southwest Research Institute, November 2010.

Technical Skills

Instrumentation and Control: Simulink, LabVIEW, Omega temperature controllers, and National Instruments control and data acquisition hardware and software

Applications: Microsoft Office, Python, MATLAB, L^AT_EX, LyX, Emacs, SolidWorks, Autodesk Inventor, and other common productivity packages for Windows and Linux platforms

Python/SciPy/NumPy experience: linear algebra, polynomials, optimization, curve fitting, object oriented programming, emission control catalyst modeling, heat exchanger modeling, thermoelectric device modeling

MATLAB experience: linear algebra, polynomials, stiff ODEs, vehicle dynamics modeling, combustion catalyst modeling, vapor deposition modeling

Operating Systems: MS Windows XP, MS Windows 7, and Ubuntu Linux

Awards

The University of Texas at Austin, Austin, TX USA

Richard J. Kokes Travel Award for 22nd North American Catalysis Society Meeting

Association of Energy Engineers Foundation Scholarship Award

N.K. Wright Centennial Memorial Endowed Presidential Scholarship

Nano Night '08 Best Poster

Texas A&M University, College Station, TX USA

American Society of Materials (ASM) International (Houston Chapter) Scholarship

Society of Fire Protection Engineers Scholarship

Prior to University Education

Eagle Scout

Misc.

Basic ability to read, write, hear, and speak German language

Hobbies

Road cycling, mountain biking, hiking, mountaineering, fishing, hunting, rock climbing, snow boarding, snow skiing, water skiing, sailboarding, building and flying r/c sailplanes, playing guitar