COVER SHEET FOR GRANT PROPOSALS

State Board of Education

SBOE PROPOSAL NUMBER: (to be assigned by SBOE)	AMOUNT REQUESTED: *$50,000*

TITLE OF PROPOSED PROJECT:

Advancing glycerol conversion technology for commercialization for sustainable biodiesel industry

SPECIFIC PROJECT FOCUS:

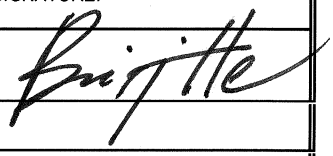
This project will further conduct an applied research to advance the glycerol conversion technology for value-added products, which has been researched and developed at the University of Idaho for three years. Successful accomplishment this project would to provide the industry with a well-needed technology to utilize the surplus crude glycerol from biodiesel production and sustain this advanced biofuel by off-setting the cost of crude glycerol disposal.

PROJECT START DATE: *July 1, 2012*	PROJECT END DATE: *June 30, 2013*

NAME OF INSTITUTION: *University of Idaho*	DEPARTMENT: *Biological and Agricultural Engineering / National Institute for Advanced Transportation Technology*

ADDRESS:

1335 West 6th Street *81A James Martin Laboratory (JML)* *Moscow, Idaho 83844-2060*	E-MAIL ADDRESS: *bhe@udiaho.edu*	PI PHONE NUMBER: *208-885-7435*

	NAME:	TITLE:	SIGNATURE:
PROJECT DIRECTOR	*B. Brian He*	*Associate professor*	
CO-PRINCIPAL INVESTIGATOR			
CO-PRINCIPAL INVESTIGATOR			
CO-PRINCIPAL INVESTIGATOR			

	NAME:	SIGNATURE:
Authorized Organizational Representative		
	John K. McIver **Vice President for Research**	
	University of Idaho	

SUMMARY PROPOSAL BUDGET

Name of Institution: *University of Idaho*

Name of Project Director: *B. Brian He*

A. FACULTY AND STAFF

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
B. Brian He / Associate Professor	*$53.48/hour*			*160 h*	*$8,556*
% OF TOTAL BUDGET: *17.13%*				**SUBTOTAL:**	***$8,556***

B. VISITING PROFESSORS

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
% OF TOTAL BUDGET:				**SUBTOTAL:**	

C. POST DOCTORAL ASSOCIATES / OTHER PROFESSIONALS

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
% OF TOTAL BUDGET:				**SUBTOTAL:**	

D. GRADUATE / UNDERGRADUATE STUDENTS

Name/ Title	Rate of Pay	No. of Months CAL	ACA	SUM	Dollar Amount Requested
TBA/ Research Assistant (RA)	*$21/h; ½ time*	*6 mo.*			*$10,920*
% OF TOTAL BUDGET: *21.84%*				**SUBTOTAL:**	***$10,920***

E. FRINGE BENEFITS Rate of Pay (%)	Salary Base	Dollar Amount Requested
23% for PI (summer)	*$8,556*	*$1,968*
3% for RA (ave. of 1%AY & 9% summ.)	*$10,920*	*$328*
	SUBTOTAL:	***$2,296***

F. EQUIPMENT: (List each item with a cost in excess of $1000.00.) Item/Description	Dollar Amount Requested
SUBTOTAL:	

G. TRAVEL: Dates of Travel (from/to)	No. of Persons	Total Days	Transportation	Lodging	Per Diem	Dollar Amount Requested
Moscow, ID / Havre, MT	*1*	*4*	*716*	*600*	*184*	*$1,500*
				SUBTOTAL:		***$1,500***

H. Participant Support Costs:	Dollar Amount Requested
1. Stipends	
2. Travel (other than listed in section G)	
3. Subsistence	
4. Other	
SUBTOTAL:	

I. Other Direct Costs:	Dollar Amount Requested
1. Materials and Supplies	*$4,074*

2. Publication Costs/Page Charges	
3. Consultant Services (Include Travel Expenses)	
4. Computer Services	
5. Subcontracts	*$18,000*
6. Other (specify nature & breakdown if over $1000) *Student support:* *one semester of in-state tuition/fees: $3,545* *summer registration fee (1-credit): $354* *health insurance (1 semester): $755*	*$4,654*
SUBTOTAL:	***$26,728***
J. Total Costs: (Add subtotals, sections A through I) **TOTAL:**	***$50,000***
K. Amount Requested: **TOTAL:**	***$50,000***
Project Director's Signature: Brigitte	Date: May 10, 2012

INSTITUTIONAL AND OTHER SECTOR SUPPORT
(add additional pages as necessary)

A. INSTITUTIONAL / OTHER SECTOR DOLLARS

Source / Description	Amount

B. FACULTY / STAFF POSITIONS

Description

C. CAPITAL EQUIPMENT

Description

D. FACILITIES & INSTRUMENTATION

Description

BUDGET NARRATIVE
Advancing glycerol conversion technology for commercialization for sustainable biodiesel industry
(to ID HERC 2012)
University of Idaho

A. Summer salary is requested for the PI as summarized as below. It is 17.13% of the total request:

No.	PI name	Salary type	Req. Time	Hourly rate	Req. Amt.
1	Brian He	Summer	160 hours	$53.48	$8,556

D. Assistantship is requested for one graduate research assistant at $21/hour based on 50% appointment for six (6) months or 520 hours, as summarized below. The planned timelines for the RA are: Jan. 1 to May 11, 2013 (academic year, 380 hours), and May 12 to June 30, 2013 (summer, 140 hours).

Name	Appointment	Time	Hourly rate	Request
Graduate research assistant	50%	01/01/2013-05/11/2013 (academic semester, 380 hrs)	$21.00	*$7,980*
		05/12/2013-06/30/2013 (summer, 140 hrs)	$21.00	*$2,940*
	Sub totals =	***520 hours***	**---**	***$10,920***

E. The rate of fringe benefits for the PI is 23% of base salary during summer; and average rate of 3% (1% for AY + 9% for summer) for the Graduate Research Assistant. The requests of fringe benefits are summarized as below:

No.	Name	Fringe rate	Request
1	Brian He (PI)	23%	*$1,968*
2	RA	3%	*$328*
		Sub total	***$2,296***

D. One domestic travel (four days) is requested for the PI to travel to and from the collaborator's site (BioEnergy Center, Montana State University-Northern, Havre, Montana). The estimated break-downs are as below:

Air-fare:	$650
+ Room:	$600 = $200/night x 3 nights
+ Shuttle/ vicinity mileage:	$66
+ Per diem (out state):	$184 = $46/day x 4 days

Total = $1,500/trip

I.1. Materials and supplies are requested for project activities, including chemicals and reagents, catalysts, analytical costs, and other consumable supplies. The total estimate is $4,074.

I.5. A request of $18,000 is proposed for the project collaborator, Dr. Randy Maglinao at the BioEnergy Center, Montana State University-Northern, Havre, Montana, on engineering testing of the process using continuous-flow systems. Detailed budget from the Montana State University-Northern is attached.

I.6. Student supports of 1 semester of in-state tuition/fees, 1-credit summer registration fee and 1 semester of health insurance, which are $3,545/semester, $354/cr, $755/semester, respectively, for the AY 2013 academic year. A total of $4,654 is requested for the Graduate Research Assistant.

J. The total direct cost is $50,000 for the project.

K. A total of $50,000 is requested for the project.

Idaho HERC FY13 Incubation Fund Program Proposal

1. **Name of Idaho public institution**

   University of Idaho

2. **Name of faculty member directing project**

   B. Brian He, *PhD & PE*

   Biological & Agricultural Engineering, University of Idaho

   P.O. Box 442060, Moscow, Idaho 83844-2060

   Ph: 208-885-7435; Fax:208-885-8923; Email: bhe@udiaho.edu

3. **If this technology been proposed for an Incubation Fund Award in the past**

   No, this is the first time, original proposal to HERC Incubation Fund.

4. **Executive Summary**

   Biodiesel production reached its historical record of 1.1 billion gallons last year in the US. For every pound of biodiesel, approximately 0.1 pounds of crude glycerol is produced as a byproduct. Dealing with the excessive crude glycerol from biodiesel production is now becoming a dilemma to the industry. The crude glycerol possesses very low value due to the impurities present. It is urgent that alternative, yet value-added, applications of such low grade glycerol have to be found to ensure the biodiesel industry's stronger and healthier growth. The PI's ultimate goal was to develop a technology that utilizes the low-grade glycerol and converts it into valuable products for enhanced sustainability of biodiesel industry. A preliminary research, supported by the National Institute for Advanced Transportation Technology (NIATT) at the University of Idaho, has been successfully conducted on converting crude glycerol into valuable alcohols including propylene glycol and ethanol. The technology can convert glycerol to value-added products with much higher

efficiency than other reported technologies. The findings from this research were disseminated and a provisional patent was filed by the University of Idaho. This technology has generated great interests with in the biodiesel industry. Three biofuels and/or bioenergy companies have contacted us and one company (Gulf Coast Fuel Resources, Huffman, TX) has signed a non-disclosure confidential agreement to implement this technology at their facility.

To advance this technology for commercialization, the engineering aspects of process scale-up and process analysis have to be thoroughly explored. Therefore, the objectives of this proposal are to conduct an investigation on the process development of glycerol hydro-thermochemical conversion to further improve process efficiencies in continuous-flow systems, and conduct an engineering evaluation on schemes of catalyst implementation and process scale-up, costs of processing and energy requirement.

The expected outcome will be a technology of glycerol hydro-thermochemical conversion to valuable alcohols to solve the challenging difficulty of surplus glycerol facing the biodiesel industry. Successful accomplishment of this project will contribute greatly to the current knowledge base on the utilization of glycerol and will benefit the entire biodiesel industry.

5. **Project Objective and Total Amount Requested**

The objective of this proposal is to conduct an investigation of the process development on glycerol hydro-thermochemical conversion to further improve process efficiency in a continuous-flow system, and to conduct an engineering evaluation on schemes of process operation, catalyst implementation, process scale-up, and on costs of processing and energy requirements. The expected outcome of this project is an advanced technology of glycerol hydro-thermochemical conversion to valuable alcohols to be used by the biodiesel industry to

solve the challenging difficulty of surplus glycerol, thus to enhance the sustainability of the emerging biodiesel industry.

In this one-year project, a **total of $50,000** is requested from the 2012 HERC Incubation Fund Program to cover the costs of manpower and materials/ supplies.

6. **How resource commitments reflect the priorities of the home institution(s)**

The Office of Technology Transfer (OTT) at the University of Idaho (UI) assists researchers in protecting innovations developed at the University. In this project, the commitments by UI include the PI's time on research, the laboratory spaces, analytical equipment and services, administrative assistance, and technical support, etc. These commitments reflect directly the priorities set by the OTT mission, i.e., "to promote the timely transfer of commercially valuable knowledge and information developed at UI to the businesses most capable of reducing them to practice. This goal benefits the economy of Idaho and the nation, and returns value to the inventor/s and to the University in support of its continuing research enterprise, in a manner that upholds sound ethical, legal, and academic standards".

This project well aligns with the University's specific research signature area of "nexus of energy production and use, agriculture and the environment", by contributing a well needed technology for sustaining the biofuels industry. As a land grant institution, the University of Idaho has also the priority in promoting product development and commercialization of technologies developed at the University, and technology transfer to public and private sectors. The strong support by OTT at UI shows its commitment in achieving this priority.

7. **Evidence that the project will have a potential impact to the economy of Idaho**

This project will have a broad impact in multiple areas. This project contributes greatly to (1) the current knowledge base on alternative utilization of crude glycerol and benefits the whole

biodiesel industry, (2) the rural economy by encouraging farmers, who are aware of all the benefits from biofuels, to grow more oil crops for biodiesel industry, (3) the research capability and continued success of biodiesel research and utilization at UI, a pioneer in biodiesel research and utilization and a go-to place for biodiesel research and information.

8. Partnerships with the public or private sector

Currently, we have started to work with the Gulf Coast Fuel Resources, Huffman, TX (please see Letter of Support attached). Once tested, the technology will be transferred to other interested companies.

9. The Market Opportunity

This project addresses the need from biodiesel producers for an advanced technology that would utilize the low value, surplus crude glycerol byproduct. Thus it will serve to sustain the emerging biofuel industry by off-setting the costs of biodiesel production and byproduct glycerol disposal.

Applications and markets for this technology exist in the biodiesel industry and other companies who are interested in exploring this field once a proven technology such as this emerges. The potential market demand for this technology is very high. It has been projected that this technology could be used to treat 850 million pounds per year from approx. 160 biodiesel producers nationwide.

Competing technologies in converting glycerol to products are available. To our knowledge, the technology we developed has the highest process efficiency to produce similar lines of products (see comparison in next section). In addition to the challenges of the scientific research, the major barriers to industry adoption are in the practical engineering aspects, such as scale-up scheme, as indicated by the objectives to be explored in this project.

10. The Technology

The technology we propose to develop is a process that converts glycerol to high value alcohols at high yields through selective *in situ* hydrogenolysis without adding external hydrogen to the system. The process is optimized to its operating conditions with the preferred nickel-based catalysts and is highly efficient with a higher conversion rate and shorter processing time (see comparison table below).

Table 1. Comparison of prior arts compared to this technology, the **He-Maglinao process**.

Process/Study	Metal catalyst	Reaction Time (h)	Propylene Glycol Yield	Glycerol Conversion
He-Maglinao	**Ni**	**0.5**	**30.6%**	**98.7%**
Roy et al.	Pt-Ru	6	21.0%	43.2%
Hondt et al.	Pt	15	54.6%	85.4%
Gandarias et al.	Pt	24	8.0%	22.7%

Notes: conditions used in all of the process: 220°C, 20% aqueous glycerol, no hydrogen added.

The technology was explored in response to the industry's call for technologies to utilize the surplus crude glycerol from biodiesel producers to sustain this emerging biofuel industry. As an environmentally beneficial alternative fuel, biodiesel production has been increased dramatically over the past decade in the US and reached a record high of 1.1 billion pounds in 2011. Meanwhile, as the principal by-product of biodiesel production, glycerol has been also generated in large quantities. For each gallon of biodiesel produced, approximately 0.8 pounds of crude glycerol accompanies. This means that approx. 850 million pounds of crude glycerol was produced in the US last year. Although pure glycerol has valuable applications in food, human care products, and pharmaceuticals, the crude glycerol has a value of $0.05/lb due to the impurities present (Lefebvre, 2009). Refining the crude glycerol to high purity for current markets is not cost effective. Therefore, finding non-traditional applications for treating such low-grade glycerol becomes an urgent research topic for the biodiesel industry and scientific community.

Because this technology exploration was initiated by responding to the industry's call, it immediately contributes to the market need. Three companies have contacted us and one company has signed a confidential agreement with UI to test it out at their facilities.

We have filed a provisional patent titled "Catalytic Conversion of Glycerol to Alcohols" (US Paten A# 61609971; filed on March 13, 2012), based on the findings from our research on this technology.

The technology has been researched and developed by the researchers at the University of Idaho since 2008. Financial support was provided for three year (2008 - 2011) by the National Institute for Advanced Transportation Technologies (NIATT) at the UI.

11. Commercialization Partners

The commercialization partners will be biodiesel producers and/or other biofuels related companies. Currently, we have started to work with the Gulf Coast Fuel Resources, Huffman, TX (please see Letter of Support attached). Once tested, the technology will be transferred to other interested companies as well.

12. Specific Project Plan and Detailed Use of Funds

The project includes three major tasks.

Task 1. Implementing heterogeneous powder catalyst in continuous-flow reactor system

The application of the Rainey nickel catalyst in solid powder form in a continuous process is different from that in a batch system. Continuous reactors are efficient in constantly collecting the product and maintaining the solid catalyst in the system in a stationary or suspended form. In this project, a new design of a series of fixed-bed catalyst modules will be employed. A special catalyst retention mechanism will be installed to maintain suspension and by prevent the catalyst from flowing out of the reactor. The catalyst retaining modules

will be designed to reduce pressure drop and minimize the chance of channel clogging. The most influential process parameters on conversion efficiency, including temperature, reaction time (feeding rate or retention time), and pressure of the reducing agent as identified in preliminary research, will be investigated and optimized for optimal catalytic conversion. Comprehensive experiments will be designed to construct conclusive yet time saving investigations. Statistical analysis will be performed on the experimental results and reaction kinetics will be studied. A kinetic model will also be established based on the optimal responses to describe the conversion process of glycerol to products in the continuous flow system. The outcome from this statistical analysis and the kinetic model can assist us in gaining additional understanding of the process and its sustainability for scale-up purposes.

Task 2. Evaluation of Multiple-Catalyst System (to be investigated at collaborator's site)

Among the ways of implementing catalysts for processing glycerol include the single catalyst system and multiple-catalyst system. Using two different types of catalysts would increase the selectivity towards targeted products in a two-stage continuous-flow reactor. This type of reactor setup allows the analysis of the intermediate products as well as the final products in order to fully investigate the reaction kinetics and reactions involved in the process. We will use the fully-integrated continuous-flow tubular reactor at the MSU-Northern campus to evaluate the process using the multiple-catalyst system. The testing will involve continuous production of the intermediates and alcohol products, process evaluation in an extended period of operating time under steady-state conditions. Table 2 summarizes the process conditions that will be evaluated. The intermediate and final products will be fully analyzed. The results will be statistically evaluated for eth effects of process parameters and different schemes of catalyst implementation on feed conversions and product yields and selectivity.

Table 2. Process parameters and conditions that will be evaluated using the two-stage continuous-flow reactor system.

Process Parameter	Two-stage tubular reactor in series		Total number of levels
	Tubular Reactor 1	Tubular Reactor 2	
Temperature	210 - 250	220-230	3
Pressure	1, 50 & 100 psi	1, 50 & 100 psi	3
Flow rate	10-40 mL/min	10-40 mL/min	2
Catalyst	copper catalysts	nickel catalyst	1
Duration of operation	3,12 & 24 h	3, 12 & 24	3

Task 3. Process Analysis and Conceptual Design

Although energy life cycle assessment (LCA) is often a necessity for projects that targets commercial applications, conduction of energy LCA on this project would be a challenge because of the complex catalytic conversion pathways and the small bench scale. To provide guideline for future analysis on energy LCA in scaled-up processes, we will conduct an analysis of the energy input and output in this small scale process by estimating the energy I/O ratios based on the energy involved. Special attention will be paid to the energy loss which is typically a significant contributor to overall energy I/O in a small scale system. Based on the experimental results from Tasks 2&3, and the energy analysis data, a conceptual process design will be performed. The conceptual process design will include mass balances, energy balances, and utility requirements of all process streams. An approximate processing costs analysis will be also included. A detailed process flowchart with summary design information will be developed.

Table 3 Project timeline.

Tasks	**Duration (July 2012 as Month 1)**			
	07/2012-09/2012	**10/2012-12/2012**	**01/2013-03/2013**	**04/2013-06/2013**
Task 1	**********			
Task 2	**********			
Task 3			**********	

The project team includes: ***Dr. Brian He***, principle investigator, ***Dr. Joe Thompson***, Engineering support Scientist, a graduate research assistant, and ***Dr. Randy Maglinao***, the collaborator at the BioEnergy Center, Montana State University – Northern. The total request is $50,000 in this proposal. A summer salary of $8,556 is requested for the PI for total 160 hours during May 12 to June 30, 2013. A request for fringe benefits is also made for the PI for $1,968 based on the requested summer salary. The graduate research assistant (RA) will perform the research activities under the PI's guideline. Salary of $10,920 is requested for the RA for six months or 520 hours (i.e., academic semester, 380 hours 01/01/-05/11/2013; and summer 140 hours, 05/12/-06/30/2013) based on 50% appointment. Fringe benefits of $328 are also requested for the RA. Additionally, student support of in-state tuition/fees, 1-credit summer registration fee, and health insurance of $4,654 is requested for the Research Assistant. Dr. Randy Maglinao will conduct research activities of Task 2. A request of $18,000 is proposed to cover the costs on engineering testing at their site (see appendix 4 for detailed budget from the collaborator). One 4-day trip is requested for the PI to travel to/from the collaborator's site (Havre, MT), with estimated cost of $1,500, for project meetings. The requested cost for materials and supplies, including chemicals and reagents, catalysts, analytical costs, and other consumable supplies, is estimated as $4,074.

13. Education and Outreach

Under the supervision of the project investigator, one (1) graduate student who is to be funded by this proposal will be in charge of the project experiment preparation, execution, and data collection. Two (2) undergraduate researchers during the academic year will participate in this project to assist in data collection and experimental operations. One (1) graduate student, not funded by this proposal, will also assist on the project in a collaborative effort to explore different aspects of this research topic.

The PI recognizes the importance of involving students in research. Through participation in the project, students will integrate their education with research in the areas of bioenergy and bioproducts. This will prepare them as scientists and engineers for the emerging biorefinery and biofuel industry. Students will also be better able to see the potential applications of their research to real-world problems. As a very important part of their higher education, students will be encouraged to participate in technical conferences and other professional society activities to enrich their experience.

14. Institutional and Other Sector Support

As in all research activities, the University of Idaho will support this project by contributing the PI's time, the laboratory spaces, analytical equipment and services, administrative assistance, and technical support, etc. The Office of Technology Transfer will work with the PI during the technology development and ensure that the intellectual rights of the University of Idaho will be well protected. As the company (Gulf Coast Fuel Resources, Huffman, TX) is to test the technology developed by the University of Idaho at their facilities, feedback from the company on issues and/or challenges in practical engineering implementation will be forwarded to the PI, which will reassess the research assumptions and provide technical details needed for thorough investigation.

APPENDICES

Appendix 1. Facilities and Equipment

The Biofuels Research Laboratory at the University of Idaho has the major equipment for conducting this proposed research. A CSTR was developed with the 300 mL PARR 4560 Pressure Reactor System (fig. 1). The reactor system is capable of being operated at 350C and 3,000 psi. It is equipped with a temperature and pressure control system; the agitation is controlled by a variable speed motor controller; a cooling mechanism is in place. A High Performance Liquid Chromatography (HPLC) pump is installed to achieve a continuous flow feeding. A pressure condenser was installed between the reactor vessel and the receiver vessel to capture condensable products. The whole system is hosted in an enclosed chamber with ventilation for safe operation of the system.

Figure 1 The fed-batch reactor system.

The other key equipment is the continuous-flow tubular reactor system. This system includes a tubular reactor assembly made of T316SS. It is rated for use to 3000 psi at 550 ºC. The reactor is 24” long and 1.0” ID to give an internal catalyst packing volume of about 300 mL.

The reactor is heated with three-zone split-tube furnace and the temperature is controlled with three Model 4838 Temperature Controllers through three thermocouples located in the side wall. One controller is equipped with a panel meter to display pressure of reactor inlet, and another is equipped with a panel meter to display the reactor internal temperature. The reactor module also includes an internal thermowell and thermocouple, catalyst support spools, a pressure gage, a pressure transducer, and a 3000 psi safety rupture disc. The high pressure gas/liquid separator of 970 mL is attached to the system, rated for 3000 psi, and equipped with a manual drain valve. A manual back pressure regulator is equipped for controlled release of gases from the Separator and to maintain reactor pressures up to 3000 psig.

Figure 2 The continuous-flow tubular reactor system.

The University of Idaho has facilities for producing, characterizing, and testing biodiesel fuel, crude glycerol and related products. Laboratory facilities include a pilot-scale biodiesel production plant, a biodiesel analytical and quality control laboratory.

The biodiesel production plant consists of two CeCoCo seed presses of 45 kg/h each with seed pre-heating capability and instrumented feed bins, several small biodiesel reactors, two batch type reactors with 1,000-liter and 2,000-liter capacity.

The analytical laboratory is established for biodiesel research. Fuel characterization that can be performed at our laboratory includes heat of combustion, cloud point, pour point, cold filter plugging point, viscosity, density, flash point, acid number, water and sediment, free and total glycerin, ultra-low sulfur, fatty acid profiles, oxidation stability, etc. Examples of the instruments in the laboratory include GC, HPLC, ultra-low sulfur tester (ppb), Rancimat tester, automatic cloud point and gel point tester, Karle-Fischer tester, etc.

Figure 3 Sample capabilities at the PI's analytical laboratory.

Appendix 2. Biographical Sketch of the PI

B. BRIAN HE, *PhD, PE* *(principle investigator)*

Associate Professor & Bioprocessing Engineer
Biological and Agricultural Engineering — (208) 885-7435
University of Idaho — (208) 885-8923 (*fax*)
Moscow, Idaho 83844-2060 — bhe@uidaho.edu

PROFESSIONAL PREPARATION

- 2000 Ph.D. Agri. Engineering, University of Illinois at Urbana-Champaign, Urbana, IL.
- 1996 M.S. Biosystems Engineering, University of Hawaii at Manoa, Honolulu, HI.
- 1986 M.S., 1983 B.S. Chemical Engineering, Tianjin University, Tianjin, China.

APPOINTMENTS

- 2007–date Associate Professor, Bio & Agri. Engg., University of Idaho, Moscow, ID.
- Fall 2007 Visiting Asso. Professor, Agri. & Bio Engg., Univ. of Illinois, Urbana, IL.
- 2001–2007 Assistant Professor, Bio & Agri. Engg., University of Idaho, Moscow, ID.
- 2000–2001 Postdoc, Agri. Engg., University of Illinois, Urbana, IL.

AREA OF SPECIALIZATION

Bioprocessing; alternative energy and value-added products from bio-based resources.

PROFESSIONAL LICENSE

Professional Engineer of Chemical Engg., Idaho Registration #:11365. June 2004 – date.

SYNERGISTIC ACTIVITIES

(1) Major co-investigator on a 2-term, 10-year project of Biodiesel Education Program (2003 – 1013, $1,950,000), sponsored by USDA under the congress' Farm Bill.

(2) Conducted three projects of Higher Education Challenge grant program as PI/co-PI to develop curriculum materials and offer courses in the areas of biorefinery, biomass conversion, and biofuels; funds totals $466,309.

(3) Visiting associate professor at the University of Illinois at Champaign-Urbana (Sept.-Dec., 2007) when I was on sabbatical; collaborated with faculty members at UIUC and worked on projects of biomass conversion for renewable energy; published one book chapter and one conference paper.

(4) Served as panelist on USDA's and DOE's grant proposal review panels in the areas of renewable energy and biofuel since 2007; grant proposal reviewer for USDA, DOE, and multiple states in the areas of renewable energy and biofuel since 2001.

(5) Associate editor of the *Transactions of the ASABE* and the *Applied Eng. in Agriculture*.

LISTING OF CURRENT SUPPORT

(1) National biodiesel education program (Phase 2). $800,000. USDA Biodiesel Fuel Education Program. 10/08 –09/12. Jon Van Gerpen, **Brian He** (co-PI), Dev Shrestha.

(2) *In situ* Transesterification of Microalgal Oil to Produce Algal Biodiesel. $57,000. National Institute for Advanced Transportation Technology. 08/11 – 12/12. **Brian He** (PI).

(3) Implementation of Biofiltration Technology. $328,328. USDA Natural Resources Conservation Service. 09/2011-08/2013. Lide Chen, Howard Neibling, **Brian He** (co-PI), Mario Emanuel DeHaro Marti.

(4) Multiple Enhanced-value Co-products from Regionally Important Oilseed Feedstocks. $599,210. USDA National Institute of Food and Agriculture Research. 07/2011-12/2014. M. Morra, **Brian He** (co-PI), C. Nindo.

(5) Biobased Energy Educational Material Exchange System (BEEMS). $59,800. 10/09 – 09/12. USDA Higher Education Challenge Grants. **Brian He** (PI). Collaborated with Ohio State University and other 3 universities. The total project award was $459,867.

(6) Production of Renewable Diesel Fuel from Biologically-based Feedstocks. $160,000 (Year 1 $70,000 and Year 2 $90,000). National Institute for Advanced Transportation Technology. 08/10 – 08/12. Jon Van Gerpen, **Brian He** (co-PI).

FIVE RELATED PUBLICATIONS

(1) He, B., and J. H. van Gerpen. 2012. Analyzing biodiesel for contaminants and moisture retention. *Biofuels* 3(3): 351-360.

(2) Maglinao, R, and B. He. 2011. Catalytic thermochemical conversion of glycerol to simple and polyhydric alcohols using Raney nickel catalyst. *Ind. & Eng. Chem. Research* 50 (10): 6028–6033.

(3) He, B., J. H. Van Gerpen, and J. C. Thompson. 2009. Sulfur content in selected oils and fats and their corresponding methyl esters. *Applied Eng. Agri.* 25(2): 223-226.

(4) Tao, C. and B. He. 2007. Process study on crambe oil enzymatic hydrolysis for erucic acid isolation. *Trans. ASABE* 50(1): 167-174.

(5) He, B., A. Singh, and J. Thompson. 2006. A novel continuous-flow reactor using reactive distillation technique for biodiesel production. *Trans. ASABE* 49(1): 107−112.

Appendix 3. Biographical Sketch of the Collaborator

RANDY L. MAGLINAO, *PhD*.
Research Associate
Bio-Energy Center, MSU-Northern, Havre, MT 59501
Tel #: (406) 262 5921 Email: randy.maglinao@msun.edu

EDUCATION

PhD	Biological and Agricultural Engineering, University of Idaho Moscow, ID 83843	2011
MS	Chemical Engineering, University of the Philippines Los Baños Laguna, Philippines	2007
BS	Chemical Engineering, University of the Philippines Los Baños Laguna, Philippines	2001

PROFESSIONAL APPOINTMENTS

Research Associate, Bio- Energy Center 2011-present
Montana State University-Northern, Havre, MT

- *Research Interest:* biodiesel production technologies, catalysis, thermochemical and chemical modification of vegetable oil and glycerol, supercritical fluid application, fuel chemistry and characterization, bio-jet fuel production, biomass conversion
- *Reviewer*: Journal of the American Chemical Society, Industrial and Engineering Chemistry Research
- *Grant Award/Research Funding*: US Department of Energy Federal Appropriation, US Economic Development Authority
- *Professional Membership*: Industrial Oil Products Division of the AOCS

Research Assistant, National Institute for Advanced Transportation 2007-2011
University of Idaho, Moscow ID
Instructor, Department of Engineering Science 2001-2007
University of the Philippines Los Baños, Laguna, Philippines

PATENTS, PUBLICATIONS AND PAPERS

Soriano, Nestor, **Randy Maglinao** and Akash Narani. Process of Converting Natural Plant Oils to Biofuels. Provisional Patent 306509-2430 MONT-131/00US.

He, Brian and **Randy Maglinao**. Catalytic Conversion of Glycerol to Alcohols. Provisional Patent in progress. University of Idaho

Maglinao, Randy and Brian He. Catalytic thermochemical conversion of glycerol to simple and polyhydric alcohols using Raney nickel catalyst. *Industrial & Engineering Chemistry Research*. 2011, 50; 6028

Maglinao, Randy and Brian He. 2009. Thermal conversion of glycerol to primary alcohols using a batch pressure reactor. ASABE Annual Meeting Papers: 2009 Reno, Nevada, June 21 – June 24, 2009 096673.

Maglinao, Randy and Brian He. 2009. Effects of temperature and sulfuric acid levels on the dehydration of glycerol. ASABE Annual Meeting Papers: 2009 Reno, Nevada, June 21 – June 24, 2009 096679.

AWARD

2011 Outstanding Graduate Student Award, College of Engineering, University of Idaho

Appendix 4. Proposal of Collaboration from Montana State University – Northern

May 9, 2012

Brian He, PhD & PE
Biological & Agricultural Engineering
University of Idaho
P.O. Box 442060
Moscow, Idaho 83844

RE: Idaho HERC FY13 Incubation Fund Program

Dear Dr. He,

I am pleased to assist you and University of Idaho in the project entitled "*Advancing Glycerol Conversion Technology for Commercialization for Sustainable Biodiesel Industry"* to be submitted to the Idaho Higher Education Research Council (HERC) FY13 Incubation Fund Program. I acknowledge the potential of the technology hydro-thermochemical processing of glycerol that you and I developed during my PhD in University of Idaho to be beneficial in the biodiesel industry. And, this proposed project will bring the technology closer to commercialization and will give new opportunities and markets for glycerol, biodiesel's by-product. I believe that this will eventually help the biodiesel industry not only in Montana as well as nationwide, and at the same time, promoting Montana's local agriculture and improving air quality. Attached is our proposal on how we can assist University of Idaho in conducting the project.

Please feel free to let me know should you have any questions or concerns regarding our participation in the project.

Sincerely,

Randy Maglinao, PhD
Research Associate
Bio-Energy Center, MSU-Northern
406.262.5921
randy.maglinao@msun.edu

Enclosed: Collaborative Research Proposal

RE: Idaho HERC FY13 Incubation Fund Program Proposal

Proposed Project: Collaborative Research on Advancing Glycerol Conversion Technology for Commercialization for Sustainable Biodiesel Industry

Principal Investigator: Randy Maglinao, PhD.

Department and Institution: Bio-Energy Center, Montana State University-Northern

I. PROJECT BACKGROUND

Biodiesel's potential as an alternative fuel is well recognized worldwide such that its production increased exponentially in the last decade. In the United States, Environmental Protection Agency (EPA) had classified biodiesel both as Advanced Biofuels and Biomass-based Diesel; and every year, EPA required target for the production and use of fuels of this classification increases under the Renewable Fuels Standards (RFS) ruling. In effect, it boosted the interest of producers and resulted to the production of 1.1 billion gallons of biodiesel in 2011. This total volume produced exceeded EPA's target of 800 million gallons. Along with the success of the biodiesel industry, production of crude glycerol, a by-product of biodiesel production, had rapidly increased. In the United States alone, more than 300,000 metric tons of crude glycerol was co-produced in 2011. This rapid fluctuation of production of crude glycerol greatly affected the market. The price of pure glycerol has dropped from $2.08/kg in 2003 to $0.92/kg in April 2011, and the price for crude glycerol was only $0.22/kg. Most of the biodiesel industry is now considering crude glycerol as a waste instead of a valuable co-product. Even though there are various applications and valuable chemicals that can be derived from glycerol, the demand for these products is not high enough to handle the growing surplus of glycerol.

The process, hydrothermochemical processing of glycerol, developed at the Department of Biological and Agricultural Engineering in University of Idaho has the potential in bringing new opportunities and markets for glycerol. Propylene glycol, one of the valuable products from the process, is commercially used as an alternative anti-freeze agent to the toxic ethylene glycol. The proposed project for advancing the hydro-thermochemical processing of glycerol for commercialization will eventually help the biodiesel industry not only in Montana and Idaho, as well as, nationwide.

The Bio-Energy Center, located in Havre, Montana, has the facilities, equipment and resources that can assist University of Idaho in conducting the proposed project to achieve its goals. The Center houses seven state-of-the-art laboratories and facilities and serve as the primary research and development arm of MSU-Northern in the field of alternative fuels. In addition to this, the Center is currently on the process of procuring a fully-integrated continuous two-stage tubular reactor and it is expected to be completely commissioned and operational by July 2012. This continuous reactor is capable to conduct processes requiring two-different catalysts and involving multiple-reaction steps and recycling of intermediate products. With the reactor's capabilities, the Center is proposing to conduct an investigation of process evaluation on hydro-thermochemical glycerol conversion to valuable alcohols using a two-stage continuous-flow reactor system.

II. RESEARCH ACTIVITIES

Evaluation of Multiple-Catalyst System in the Hydro-thermochemical Processing of Glycerol

The hydro-thermochemical processing of glycerol uses heterogenous catalysts to afford the conversion of glycerol to valuable alcohols. There are several ways to implement the catalysts for processing glycerol such as single catalyst system and multiple-catalyst system. Using multiple-catalyst system, it is proposed that utilizing two different catalysts may increase the selectivity of this process in producing targeted products. Therefore, an investigation of the process using multiple-catalysts system is also necessary to explore all possible schemes for further advancing the process. For this type of catalyst system, it is necessary to use a two-stage continuous reactor. This type of reactor setup allows the analysis of the intermediate products as well as the final products in order to fully investigate the reaction kinetics and reactions involved in the process.

The Center will use the fully-integrated continuous tubular reactor that is expected to be completely commissioned and installed at the MSU-Northern campus by July 2012 to conduct evaluation of the process using multiple-catalyst system. The Center will commit up to 100 hours of testing. The testing will involve continuous production of the intermediates and alcohol products using the reactor, process evaluation by operating longer periods, ranging from 3 to 24 hours, under steady-state conditions. Table 1 summarizes the process conditions that will be evaluated. The Center will also utilize its equipment and facilities such as GC/MS to analyze the composition of the intermediate products and final products. The results from the tests will be statistically evaluated for effects of the parameters and different schemes of catalyst implementation to the product yields, conversions and product selectivity.

Table 1. Process parameters and conditions that will be evaluated using the two-stage continuous-flow reactor system.

	Two-stage tubular reactor in series		Total number of levels that will be evaluated
Process Parameter	Tubular Reactor 1	Tubular Reactor 2	
Temperature	210 - 250	220-230	3
Pressure	1, 50 & 100 psi	1, 50 & 100 psi	3
Flow rate	10-40 mL/min	10-40 mL/min	2
Catalyst	copper catalysts	nickel catalyst	1
Duration of operation	3,12 & 24 h	3, 12 & 24	3

III. FACILITIES, EQUIPMENT AND OTHER RESOURCES

The Bio-Energy Center at Montana State University-Northern

The Bio-Energy Center located in Havre, Montana houses seven state-of-the-art laboratories and facilities and serve as the primary research and development arm of MSU-Northern in the field of alternative fuels. The laboratories include: Fuel Chemistry Lab, Kiewit Oil Analysis Lab, Biomass Conversion Lab, Chassis and Engine Performance Lab, Emission Facilities, Biodiesel Pilot Plant and Oilseed Pressing Facilities. The Fuel Chemistry Lab, Kiewit Oil Analysis Lab, Biomass Conversion Lab and the Oilseed Pressing Facilities are the key laboratories that will be utilized to support this project.

The Fuel Chemistry Lab

The Fuel Chemistry Lab is equipped with several instrumentation for fuel and biofuel testing and characterization in accordance to ASTM protocols. These includes a Tanaka APM-7 Pensky-Marten closed cup test unit for flash point testing, a Herzog HVU482 automatic viscosity analyzer, an ANTEK 9000NS elemental analyzer for sulfur content determination, a Herzog HCP 852 cloud point and pour point tester, a Tanaka AFP-102 for cold filter plugging point testing, a Herzog HDV 632 vacuum distillation unit, an Omnion OSI for oxidation stability analysis, an Alcor MCRT 160 for microcarbon residue determination, a Metler Toledo T50 for total acid analysis, a Koehler copper strip corrosion tester, a Cou-Lo-Aquamax Karl-Fischer moisture meter, a Grabner IROX for cetane number, cetane index, distillation temperature, aromatic content, and density determinations, a Precision centrifuge for water and sediment determinations, a Petrotest ADV 4 for atmospheric distillation testing, a Petrotest PetroOxy analyzer for oxidation stability determination, a Perkin Elmer Clarus 500 gas chromatograph equipped an FID detector and an Agilent 7890A gas chromatograph equipped with an FID detector, Gerstel MPS 2 autosampler and a head-space analysis capabilities.

The Kiewit Oil Analysis Lab

The Kiewit Oil Analysis Lab houses a Leeman's Lab PROFILE Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) for several elemental analyses, a Nicolet Protégé 460 Fourier-Transform Infrared Spectrometer (FT-IR) for functional group analysis and an Olympus BX51 polarized light microscope equipped with Linkam temperature control system for fuel crystallization behavior study.

The Biomass Conversion Lab

The Biomass Conversion Lab is equipped with a 500-mL high pressure reactor equipped with overhead stirrer and temperature control and an Agilent 7890A Gas Chromatograph/5975C Mass Spectrometer (GC/MS) equipped with an Agilent 7693 autosampler.

The Oilseed Pressing Facilities

The Oilseed Pressing Facilities housed five Kern Kraft 40 Oilseed Presses and Kern Kraft 40 Filter Press, which will be used for mechanical extrusion of oil from camelina seeds.

Two-Stage Continuous-Flow Reactor

The continuous flow reactor is a two-stage tubular reactor in series and can handle high pressure (3000 psi) and high temperature (550°C). The reactor system also have high pressure vessels (with the same pressure rating as the tubular reactor) installed at each end of the tubular reactor to separate the excess gas from the liquid products. Two high pressure pumps are installed at the inlets of each tubular reactor.

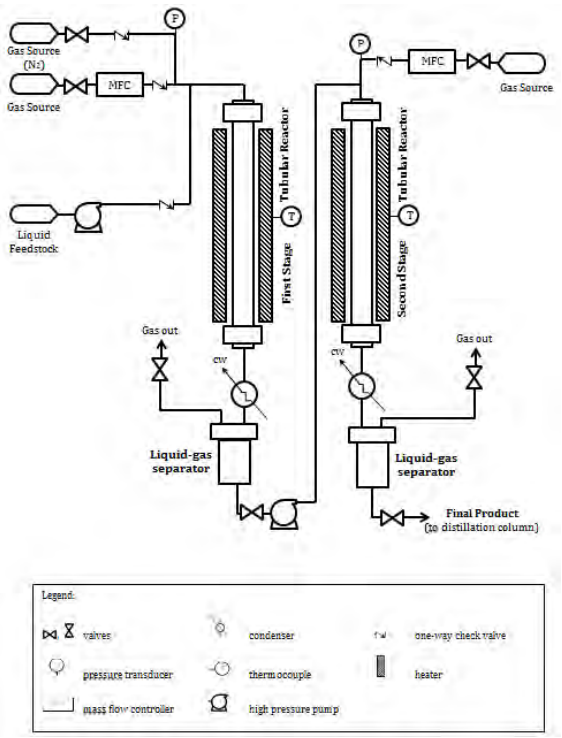


Figure 1. Schematic drawing of the two-stage continuous flow reactor.

Other Resources

The salaries of the P.I. of the project will be primarily supported by a grant awarded to MSU-Northern Bio-Energy Center and Bear Paw Development Corporation (*US Economic Development Administration; Implementation of North Central Montana Renewable Industry Initiative*). With our existing partnership with Opportunity Link Inc. (OL), an organization based in Havre, Montana, the Bio-Energy Center has access to resources that will support the planning of a demonstration scale biorefinery in Montana through the sustainable planning grant awarded to OL (*North Central Montana Regional Plan for Sustainable Development*) by the U.S. Department of Housing and Urban Development (HUD).

Appendix 5. Budget and Support from Montana State University – Northern

MSU-Northern
Bio-Energy Center

The Bio-Energy Center
P.O. Box 7751
Havre, MT 59501
www.bioenergytestingcenter.com

May 9, 2012

Brian He, PhD & PE
Biological & Agricultural Engineering
University of Idaho
P.O. Box 442060
Moscow, Idaho 83844

RE: Budget Proposal, Idaho HERC FY13 Incubation Fund Program

Dear Dr. He,

The MSU-Northern Bio-Energy Center is pleased to support your project entitled "*Advancing Glycerol Conversion Technology for Commercialization for Sustainable Biodiesel Industry*" to be submitted to the Idaho Higher Education Research Council (HERC) FY13 Incubation Fund Program. MSU-Northern Bio-Energy Center is proposing a total amount of ***$18,000.00*** to be allotted on the task of the project that will be conducted at the Center.

The Bio-Energy Center will allow the use of the fully-integrated continuous tubular reactor that will be commissioned by July 2012 through the US Economic Development Authority (EDA) grant. The reactor will be installed and operated at MSU-Northern campus. Here is the breakdown of the cost.

1.	Operation of the Continuous Tubular Reactor (for 100 hours)	$5,000.00
2.	Product Analysis (GC/MS)(rate: $500.00 per sample)	$10,00.00
3.	Catalysts and glycerol	$3,000.00

The Bio-Energy Center will charge at a rate of $50.00 per hour for the use of the Center's reactor with a total of $5000.00. This will cover operational and maintenance costs, such as electricity, reagents for cleaning and personnel. The Center will also collect samples from the reactor and immediately analyze the intermediate and final products using GC/MS available at the Center. The analysis will determine the composition of the targeted products such as propylene glycol and ethanol. The total cost at $500.00 per sample is at $10,000. This cost will cover operational cost of the equipment such as GC standards, helium gas, solvents such as heptane, and personnel. Finally, a total amount of $3,000 will be allotted for the cost of catalysts and pure and crude glycerol that will be used during testing.

Sincerely,

Gregory D. Kegel

Greg Kegel, Dean
MSU-Northern College of Technical Sciences
Havre, MT 59501
(406) 265-4157
kegel@msun.edu

MSU-Northern
Bio-Energy Center

The Bio-Energy Center
P.O. Box 7751
Havre, MT 59501
www.bioenergytestingcenter.com

May 9, 2012

Brian He, PhD & PE
Biological & Agricultural Engineering
University of Idaho
P.O. Box 442060
Moscow, Idaho 83844

RE: Idaho HERC FY13 Incubation Fund Program

Dear Dr. He,

The MSU-Northern Bio-Energy Center is pleased to support your project entitled "*Advancing Glycerol Conversion Technology for Commercialization for Sustainable Biodiesel Industry*" to be submitted to the Idaho Higher Education Research Council (HERC) FY13 Incubation Fund Program. We are very excited to partner with your organization as well with Gulf Coast Fuel Resources, LLC to accomplish such a meaningful undertaking that will address the challenging difficulty of growing surplus of glycerol facing the biodiesel industry. We acknowledge the potential of the project in bringing new opportunities and markets for glycerol, biodiesel's by-product. Advancing the hydro-thermochemical processing of glycerol, that was develop at University of Idaho, for commercialization will eventually help the biodiesel industry not only in Montana as well as nationwide, and at the same time, promoting Montana's local agriculture and improving air quality.

The project addresses some of the challenges associated with biodiesel which is the excessive production of crude glycerol. The project will conduct process development on hydro-thermochemical conversion of glycerol to valuable alcohols to further improve process efficiency in a continuous-flow system. Moreover, it will evaluate on different schemes of catalyst implementation and process scale-up, process cost analysis and energy requirement which are all necessary information in commercializing a new technology.

As per our planning sessions, the Center is partnering with University of Idaho and Gulf Coast Fuel Resources, LLC with the following commitment for the project:

- *Continuous Reactor Testing*
  The Bio-Energy Center will allow the use of the fully-integrated two-stage continuous tubular reactor that will be commissioned by July 2012 through the US Economic Development Authority (EDA) grant. This grant aimed to enter into collaboration with potential and public and private sector partners to expand the role of the Bio-Energy Center beyond the current region and as its core mission, to enter to commercial research into bio-fuels research and development. The reactor will be installed and operated in MSU-Northern campus. The total cost of the test is at $18,000.

- *Personnel*
  The Center through the US EDA grant will allow Dr. Randy Maglinao to work on the project and will also provide his compensation for up to 200 hours of research work. With his expertise on the hydro-

MSU-Northern
Bio-Energy Center

The Bio-Energy Center
P.O. Box 7751
Havre, MT 59501
www.bioenergytestingcenter.com

thermochemical conversion of glycerol to valuable alcohols, he will plan, design, and execute experiments to further improve the efficiency of the process using the two-stage continuous tubular reactor.

We hope that HERC recognize the project's impact to the biodiesel industry, agriculture and the environment and be in favor of supporting our effort to conduct this undertaking.

Please feel free to let us know should you have any questions or concerns regarding our participation in the project.

Sincerely,

Gregory O. Kegel

Greg Kegel, Dean
MSU-Northern College of Technical Sciences
Havre, MT 59501
(406) 265-4157
kegel@msun.edu

Appendix 6. Letter of Support from Industry

Gulf Coast Fuel Resources, LLC

Physical Address: 9050 Mykawa Road
Houston, TX 77006
Main Office: 9595 Six Pines Suite 8210
The Woodlands, TX 77380
Mailing Address: P.O. Box 502
Huffman, TX 77336
USA

Phone: 281-385-9310
Fax: 888-863-6467
www.gulfcoastfuelresources.com

May 8, 2012

Our Ref No.: GCFR20120509PG

Dr. B. Brian He,
Biological & Agricultural Engineering
University of Idaho
P.O. Box 442060
81A James Martin Laboratory (JML)
Moscow, Idaho 83844-2060

Dear Dr. He:

I would like to congratulate you, Randy Maglinao, and your staff on your accomplishments to date regarding your research in the conversion of glycerin to propylene glycol. Our company, Gulf Coast Fuel Resources (hereafter referred to as GCFR), is excited to learn about your research and we are looking forward to the opportunity of possibly working with you and the University of Idaho on commercial production of propylene glycol and other value added chemicals. GCFR offers this letter of support to assist your efforts in securing further means of research in this field.

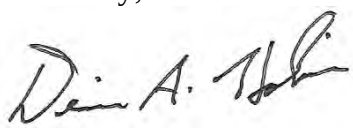
For some time, GCFR has been seeking a solution to convert crude glycerin (a by-product of bio diesel production), to useful commodity chemicals. Through extensive research, GCFR believes the glycerin to propylene glycol method to be cheaper and more environmentally friendly than the traditional petroleum derived method. You and your staff at the University of Idaho have effectively developed a method of converting glycerin to propylene glycol. Although there are a few other universities and institutions conducting similar studies, the highlight of your research thus far should be noted that your conversions have been conducted without the addition of external hydrogen. According to GCFR's research, all other universities and institutions performing similar conversions are adding external hydrogen. GCFR believes that the absence of external hydrogen offers a more cost effective method and could possibly be considered carbon neutral. Thus far your

conversion method appears to be the most cost effective, but GCFR believes that using crude glycerin in lieu of USP or Tech Grade glycerin would maximize production cost; therefore we are constructively suggesting more research be conducted by you and the University of Idaho using crude glycerin as a feedstock. GCFR is very optimistic that future research using crude glycerin feedstock will prove viable. To sum it up, GCFR believes that the already proven method developed by you and the University of Idaho of not adding external hydrogen and possibly proving the conversions could be conducted using crude glycerin feedstock in the future, will be the two biggest factors setting your research and the University of Idaho ahead of the competition.

GCFR believes the demand for propylene glycol will see gradual yearly consumption increases in years to come with Asia seeing the largest increase. Most bio diesel refineries are seeking an outlet for their spent crude glycerin resulting from fuel production. There is a limited market for surplus crude glycerin and in some cases the bio diesel refinery could be hampered with disposal expenses. If you and the University of Idaho could offer a viable solution to use the crude glycerin as a chemical feedstock, this will increase the economics for bio fuel producers, provide green solutions for commodity chemical manufacturers, as well as provide a cheaper route to value added chemicals versus the traditional petroleum route. Since most glycerin users require a glycerin product that is refined, it can be expensive to refine crude glycerin and pose a cost burden to bio diesel producers. By offering a solution of the use of crude glycerin as a chemical feedstock, it is clearly beneficial to bio diesel producers, chemical manufacturers, you and the University of Idaho, as well as the general public (IE. State of Idaho) in many ways. GCFR strongly believes in this research and could easily put these methods to commercial use in producing value added chemicals.

Please let me know if I can offer further assistance. As a background, I am offering a brief summary of our organization. At GCFR, we are a licensed diesel fuel distributor in the State of Texas. Our activities to date include the production of bio-diesel, fuel distribution, chemical marketing and production, as well as research and business development in alternative fuels and energy sources. GCFR is aggressively expanding activities in the US and abroad.

Sincerely,



Dennis A. Hoskins, Managing Partner
Gulf Coast Fuel Resources, LLC - USA
Office: 281-385-9310, Mobile: 501-840-5592, Fax: 888-863-6467
E-mail: dhoskins@gulfcoastfuelresources.com

Appendix 7. The PI's Full Length CV

NAME: He, Bingjun Brian **DATE:** **May 6, 2012**
RANK OR TITLE: Associate Professor / Bioprocessing Engineer
DEPARTMENT: Biological and Agricultural Engineering, University of Idaho
OFFICE AND ZIP: 81A James Martin Laboratory
Campus zip: 2060
OFFICE PHONE: (208) 885-7435
OFFICE FAX: (208) 885-8923
EMAIL: bhe@uidaho.edu
WEB: http://www.uidaho.edu/~bhe/

DATE OF FIRST EMPLOYMENT AT UI: May 2, 2001

DATE OF TENURE: August 12, 2007

DATE OF PRESENT RANK OR TITLE: August 12, 2007

EDUCATION BEYOND HIGH SCHOOL

Degrees:

Ph.D., University of Illinois at Urbana-Champaign, Urbana, IL. May 2000. Agricultural Engineering. Dissertation title: *Thermochemical Conversion of Swine Manure to Produce Oil and Reduce Waste*.

M.S., University of Hawaii at Manoa, Honolulu, HI. December 1996. Biosystems Engineering. Thesis title: *Characterization and operation of a novel air-lift perfusion bioreactor for mass culture of fungal pellets*.

M.S., Tianjin University, Tianjin, China. June 1986. Organic Chemical Engineering. Thesis title: *Application of reactive distillation to the synthesis of trioctyl trimellitate (TOTM)*.

B.S., Tianjin University, Tianjin, China. July 1983. Chemical Engineering. Thesis title: *Process design for the synthesis of phthalic anhydride from o-xylene*.

Certificates and Licenses:

Professional Engineer of Chem. Eng., State of Idaho. Registration #:11365. June 2004 – date.

Fundamentals of Engineering (EIT), July 1995

EXPERIENCE

Teaching, Extension and Research Appointments:

Associate Professor / Food & Bioprocessing Engineer, University of Idaho. Aug. 2007 – date
Visiting Associate Professor, University of Illinois, Urbana, Illinois. Sept. 2007 – Dec. 2007
Assistant Professor / Food & Bioproce Engineer, University of Idaho. May 2001 – Aug. 2007
Postdoctoral Research Associate, University of Illinois, Urbana, Illinois. May 2000 – May 2001
Research Assistant, University of Illinois, Urbana, Illinois. Sept. 1996 – May 2000
Research Assistant, University of Hawaii at Manoa, Honolulu, Hawaii. Sept. 1993 – Aug. 1996
Associate Research Scientist/Process Engineer, Tianjin R&D Center for Petrochemical Technology, Tianjin, China. June 1986 – Aug. 1993

Academic Administrative Appointments:

Research Secretary, Tianjin R&D Center for Petrochem.Technology, Tianjin, China (1987–1991)

AREAS OF SPECIALIZATION:

Bioprocessing engineering; alternative energy and value-added products from bio-based resources.

TEACHING ACCOMPLISHMENTS

Courses Taught:

ASM/FST433 Agricultural Processing Systems

Spring 2010	15 students	Student evaluation:	instructor-4.0/4.0; course-3.7/4.0
Spring 2006	32 students	ASM Student evaluation:	instructor-3.8/4.0; course-3.7/4.0
		FST Student evaluation:	instructor-3.5/4.0; course-3.3/4.0
Spring 2004	23 students	ASM Student evaluation:	instructor-3.8/4.0; course-3.8/4.0
		FST Student evaluation:	instructor-3.9/4.0; course-3.0/4.0
Spring 2002	9 students	Student evaluation: 3.24/4.0 (average of 5 categories)	

ASM499 Directed Study - Agricultural Processing Systems

Spring 2007 2 students

BAE143 Engineering Problem Solving

Spring 2007	16 students	Student evaluation: instructor-3.6/4.0; course-3.3/4.0
Spring 2006	12 students	Student evaluation: instructor-3.3/4.0; course-2.9/4.0
Spring 2005	13 students	Student evaluation: instructor-3.1/4.0; course-2.7/4.0
Spring 2004	15 students	Student evaluation: instructor-3.1/4.0; course-3.6/4.0

BAE242 Engineering Analysis and Design

Fall 2010	10 students	Student evaluation: instructor-3.6/4.0; course-3.4/4.0
Fall 2008	9 students	Student evaluation: instructor-3.7/4.0; course-3.1/4.0
Fall 2006	11 students	Student evaluation: instructor-3.4/4.0; course-3.1/4.0
Fall 2005	8 students	Student evaluation: instructor-2.0/4.0; course-2.8/4.0
Fall 2004	13 students	Student evaluation: instructor-3.5/4.0; course-3.3/4.0
Fall 2003	15 students	Student evaluation: instructor-3.4/4.0; course-3.1/4.0
Fall 2002	16 students	Student evaluation: instructor-3.5/4.0; course-3.3/4.0
Fall 2001	15 students	Student evaluation: 3.46/4.0 (average of 5 categories)

BAE361 Transport Processes in Biological Systems

Spring 2002 7 students Student evaluation: 3.66/4.0 (average of 5 categories)

BAE461 Bioprocess Engineering (Agricultural Processing)

Spring 2011	15 students	Student evaluation: instructor-3.8/4.0; course-3.8/4.0
Spring 2009	23 students	Student evaluation: instructor-4.0/4.0; course-3.9/4.0
Spring 2007	15 students	Student evaluation: instructor-4.0/4.0; course-3.7/4.0
Spring 2005	20 students	Student evaluation: instructor-3.7/4.0; course-3.4/4.0
Spring 2003	20 students	Student evaluation: instructor-3.7/4.0; course-3.4/4.0

BAE398 Engineering Cooperative Internship

Fall 2008	1 student	Fall 2007	1 student
Summer 2005	1 student	Fall 2004	1 student

BAE499 Directed Study

Fall 2004 Bioprocess Engineering (1 student)

BAE502 Directed Study – graduate course

Spring 2004 Thermochemical Conversion Processes for Biomass Processing (2 students)

BAE 504 Special Topics

Fall 2009 Thermochemical Technologies for Biomass Conversion (5 students)

Fall 2008 Production and Uses of Biofuels (*co-taught with Dr. Jon Van Gerpen*) 6

Fall 2006 Biomass & Biorefinery (14 students)
Student evaluation: instructor-3.2/4.0; course-2.8/4.0

BAE 494/ 594 Thermochemical Technologies for Biomass Conversion
Fall 2011 5 graduate students and 1 undergraduate student

Students Advised:

Undergraduate advisees:

Fall 2011	13 *(3 as 2^{ndary})*	Spring 2011	15 *(4 as 2^{ndary})*
Fall 2010	16 *(4 as 2^{ndary})*	Spring 2010	20 *(3 as 2^{ndary})*
Fall 2009	21 *(5 as 2^{ndary})*	Spring 2009	18 *(5 as 2^{ndary})*
Fall 2008	21 *(4 as 2^{ndary})*	Spring 2008	*(on sabbatical leave)*
Fall 2007	*(on sabbatical leave)*	Spring 2007	15
Fall 2006	16	Spring 2006	12
Fall 2005	18	Spring 2005	13
Fall 2004	13	Spring 2004	16
Fall 2003	16	Spring 2003	14
Fall 2002	14	Spring 2002	5
Fall 2001	7		

Faculty Advisor of Biosystems Engineering Club (2002 – 2005; 2009 - 2010).

Undergraduate Researchers:

Kenneth Pete	Agribusiness / REU program	(Fall 2010, Spring 2011, Fall 2011)
Sonam Sherpa	Chemical & Materials Engineering	(Fall 2010, Spring 2011, Fall 2011)
Sweta Khanal	Chemical & Materials Engineering	(Fall 2010, Fall 2011)
Sushant Kshetri	Chemical & Materials Engineering	(2009, 2010, Spring 2011, Fall 2011, Spring 2012)
Sohana Khanal	Materials Science & Engineering	(Fall 2006, Spring 2007)
Anthony Pastrama	Biological & Agri. Engineering	(Fall 2006, Sp. 2007, Summ. 2009)
Safal Kshetri	Biological & Agri. Engineering	(Fall 2009)
Jame McCall	Agricultural Systems Management	(Fall 2006, Spring 2007)
Duch Routt	Biological Systems Engineering	(Fall 2004, Summ. 2005, Fall 2005)
Beryl Childs	Biological Systems Engineering	(Spring 2004, Fall 2004)
Becky Rule	Biological Systems Engineering	(Fall 2003, Spring 2004)
Andrew Miles	Chemical Engineering	(Fall 2003, Spring 2004)
Lucas McCormick	Biological Systems Engineering	(Fall 2002, Spring 2003)

External Academic Advisor:

Yao Zhang	Senior student, Culminating Project, Pullman High School, Pullman, WA (Summer 2007 – Spring 2008)
James Ashby	Graduate student of Play Writing, Carnegie Mellon's Dramatic Writing program, School of Drama, Carnegie Mellon University (Spring 2007)

Graduate Students:

As major advisor:

Dongyun Wang	MS, Biological and Agricultural Engineering (08/2011 – date). Thesis title *(tentative) Catalysts for hydrogenation and deoxygenation of plant oils and animal fats for renewable diesel production*. In progress.
Zheting Bi	MS, Biological and Agricultural Engineering (08/2010 – date). Thesis title *(tentative) Characterization of micro-algae for biofuel production*.

	In progress.
Randy Maglinao	Ph.D., Biological and Agricultural Engineering (08/2007 – 05/2011). Thesis title *Thermochemical conversional of glycerol to primary and polyhydric alcohols*. Completed in May 2011.
Naresh Pachauri	M.S., Biological and Agricultural Engineering (08/2005 – 05/2008). Thesis title *Performance of a bench-scale reactive distillation reactor for continuous biodiesel production*. Completed in May 2008.
Arvinder P. Singh	M.S., Biological and Agricultural Engineering (01/2004 –12/2005). Thesis title: *Continuous-flow reactive distillation system for biodiesel production via transesterification*. Completed in Dec. 2006.
Chunchang Tao	Ph.D., Biological and Agricultural Engineering (08/2002 – 05/2006). Dissertation: *Integrated enzymatic processing of HEA vegetable oils for erucic acid isolation and biodiesel production: process investigation and a new bi-level kinetic model for solvent-free vegetable oil hydrolysis by water-soluble lipase*. Completed in May 2006.

Graduate committees served:

Carlo Munoz	MS, Biological and Agricultural Engineering, UI. Thesis: TBA. Served since 2012. Major professor: Jon Van Gerpen. (*In progress*).
Maxine Prior	MS, Biological and Agricultural Engineering, UI. Thesis: TBA. Served since 2012. Major professor: Thomas Hess. (*In progress*).
Tushar Jain	Ph.D., Biological and Agricultural Engineering, UI. Dissertation *(tentative)*: Conversion of lignocellulosic biomass to ethanol. Served since 2009. Major professor: Jon Van Gerpen. (*In progress*).
Jeremiah Dubie	MS, Food Science, UI. Thesis TBA. Served since 2011. Major professor: Caleb Nindo. *(In progress)*.
John Herkes	Ph.D., Biological and Agricultural Engineering, UI. Dissertation *(tentative)*: *Biodiesel production for the Palouse region*. Served since 2005. Major professor: Charles Peterson/Jon Van Gerpen. *(In progress)*.
Keegan Duff	MS, Biological and Agricultural Engineering, UI. Thesis: Development of a New MALDI-TOF-MS Technique for the Identification of Sterol Glucosides Determination of plant sterols in biodiesel. Served 2009-2011. Major professor: Jon Van Gerpen. Completed in June 2011.
Anup Pradhan	Ph.D., Biological and Agricultural Engineering, UI. Dissertation: *Life cycle analysis of soybean biodiesel production*. Served 2006–2010. Major professor: Dev Shrestha. Completed in May 2010.
Jacob Wall	MS., Biological and Agricultural Engineering, UI. Thesis: *Comparison of methods for the purification of biodiesel*. Served 2008 –2009. Major professor: Jon Van Gerpen. Completed in Aug. 2009.
Rong Dong	Ph.D., Agricultural and Biological Engineering, University of Illinois at Urbana-Champaign. Dissertation: *Hydrothermal process for bioenergy production from corn mill fiber and swine manure*. Served 2007 –2008. Major professors: Xinlei Wang/Yuanhui Zhang. Completed in Dec. 2008.
Paul Wang	Ph.D., Biological and Agricultural Engineering, UI. Dissertation: *Isopropyl esters as potential solutions to biodiesel challenges.* Served

	2005–2007. Major professor: Jon Van Gerpen. Completed in Dec. 2007.
Artur K.Zawadzki	Ph.D., Biological and Agricultural Engineering, UI. Dissertation: *Biodiesel quality sensing usingspectroscopy and artificial intelligence.* Served 2005–2007. Major professor: Jon Van Gerpen. Completed in Dec. 2007.
Bo Hu	Ph.D., Biosystems Engineering, WSU. Dissertation: *Biological hydrogen production via self-immobilized bacteria*. Served 2006–2007. Major professor: Shulin Chen. Completed in June 2007.
Yan Liu	Ph.D., Biosystems Engineering, WSU. Dissertation *Co-production of lactic Acid and chitin from A pelletized filamentous Rhizopus oryzae culture using agricultural residue – cull potatoes*. Major professor: Shulin Chen. Completed in Dec. 2005.
Wei Liao	Ph.D., Biosystems Engineering, WSU. Dissertation: C*o-production of fumaric acid and chitin using Rhizopus Oryzae fermentation on a nitrogen-rich agricultural residue - dairy manure*. Major professor: Shulin Chen. Completed in Dec. 2005.
J. Andy Soria	Ph.D., Forest Products, UI. Dissertation: *Supercritical methanol treatment of wood for chemical production*. Major professor: Armando McDonald. Completed in Dec. 2005.
Huajing Xing	MS, Chemical Engineering, UI. Thesis: *Using NMR imaging to investigate the role of glass transition on moisture transport in foods*. Major professor: Pawan Singh, UI. Completed in 2004.
Tao Wang	MS, Food Science and Toxicology, UI. Thesis: *Production of lactic acid from potatoes and potato processing paste using amylolytic lactic acid bacterial strains*. Major professor: Gulhan Yeksel, UI. Completed in 2004.
Nabil Albaloushi	Ph.D., Biological and Agricultural Engineering, UI. Dissertation: *Deep-Fat Frying of Potato Strips: Simulation of heat and mass transfer and experimental measurements of texture*. Major professor: Mark E. Casada, UI. Completed in 2003.
Samuel Jones	MS, Biological Systems Engineering, UI. Thesis: *Injector coking analysis of used vegetable oil fuel blend in a DI diesel engine*. Major professor: Charles L. Peterson, UI. Completed in 2002.

SCHOLARSHIP ACCOMPLISHMENTS
Refereed Publications:

***Refereed Journal Papers*:**

He B., and J. H. van Gerpen. 2012. Analyzing biodiesel for contaminants and moisture retention. *Biofuels* 3(3): 351-360.

Maglinao, R, and B. He. 2011. Catalytic thermochemical conversion of glycerol to simple and polyhydric alcohols using Raney nickel catalyst. *Ind. & Eng. Chem. Research* 50 (10): 6028–6033.

Hansen, A., B. He, and N. Engeseth. 2011. Food versus fuel characteristics of vegetable oils and animal fats. *Trans. ASABE* 54(4): 1407-1414.

Zhang T., Y. Chao, N. Liu, J. Thompson, M. Garcia1-Preze, B. He, J. Van Gerpen, and S. Chen. 2011.

Case study of biodiesel-diesel blends as a fuel in marine environment. *Advances in Chemical Engineering and Science* (1):65-71.

He, B., J. H. Van Gerpen, and J. C. Thompson. 2009. Sulfur content in selected oils and fats and their corresponding methyl esters. *Applied Eng. Agri.* 25(2): 223-226.

Soria, J.A., A. G. McDonald, and B. He. 2008. Wood solubilization and depolymerization by supercritical methanol. Part 2: Analysis of methanol soluble compounds. *Holzforschung* (*Wood Chemistry & Wood Microbiology Research*) 62(4):409-416.

Zawadzki, A., D. S. Shrestha, and B. He. 2007. Biodiesel blend level detection using ultraviolet absorption Spectra. *Trans. ASABE* 50(4): 1349–1353.

He, B., J. Thompson, D. Routt, and J. Van Gerpen. 2007. Moisture absorption in biodiesel and its petro-diesel blends. *Applied Eng. Agri.* 23(1): 71–76.

He, B., A. Singh, and J. Thompson. 2007. Function and performance of a pre-reactor to reactive distillation column for biodiesel production. *Trans. ASABE* 50(1): 123–128.

Thompson, J., and B. He. 2007. Biodiesel production using static mixers. *Trans. ASABE* 50(1): 161–165.

Tao, C. and B. He. 2007. Process study on crambe oil enzymatic hydrolysis for erucic acid isolation. *Trans. ASABE* 50(1): 167–174.

Xing, H., P. Singh, G. Helms, and B. He. 2007. NMR imaging of continuous and intermittent drying of pasta. *J. Food Eng.* 78(1): 61–68.

Williams, B.C., B. He, D.F. Elger, and B.E. Schumacher. 2007. Peer evaluation as a motivator for improved team performance in Bio/Ag engineering design classes. *International Journal of Engineering Education* 23(4): 698–704.

Singh, A., B. He, J. Thompson, and J. Van Gerpen. 2006. Process optimization of biodiesel production using different alkaline catalysts. *Applied Eng. Agri.* 22(4): 597–600.

He, B., A. Singh, and J. Thompson. 2006. A novel continuous-flow reactor using reactive distillation technique for biodiesel production. *Trans. ASABE* 49(1): 107−112.

Thompson, J. and B. He. 2006. Characterization of crude glycerol from biodiesel production from multiple feedstocks. *Applied Eng. Agri.* 22(2): 261–265.

He, B., A. Singh, and J. Thompson. 2005. Experimental optimization on a continuous-flow reactive distillation reactor for biodiesel production. *Trans. ASABE* 48(6): 2237–2243.

Tao, C. and B. He. 2005. Enzymatic isolation and enrichment of erucic acid from HEA seed oils: current status. *Trans. ASAE* 48(4): 1471–1479.

He, B., Y. Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 2001c. Effects of alternative process gases on the thermochemical conversion process of swine manure. *Trans. ASAE* 44(6):1865–1871.

He, B., Y. Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 2001b. Preliminary characterization of raw oil product from thermochemical conversion of swine manure. *Trans. ASAE* 44(6):1873–1880.

He, B., Y. Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 2001a. Feedstock pH, initial CO amount, and solids content effects on the thermochemical conversion process of swine manure. *Trans. ASAE* 44(3):697–701.

He, B., Y. Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 2000b. Operating temperature and retention time effects on the thermochemical conversion process of swine manure. *Trans. ASAE* 43(6):1821–1825.

He, B., Y. Zhang, T. L. Funk, G. L. Riskowski, and Y. Yin. 2000a. Thermochemical conversion of swine manure: an alternative process of waste treatment and renewable energy production. *Trans. ASAE* 43(6):1827–1833.

Su, W. and B. He. 1997. Production of secreted enzymes by fungal pellets in a perfusion bioreactor. *J. Biotechnol.* 54:43–52.

Su, W., B. He, H. Liang, and S. Sun. 1996. A perfusion air-lift bioreactor for high density plant cell cultivation and secreted protein production. *J. Biotechnol*. 50:225–233.

***Refereed Book Chapters*:**

Van Gerpen, J.H., and B. He. 2010. Chapter 15: Biodiesel Production and Properties. In *Thermochemical Conversion of Biomass to Liquid Fuels and Chemicals*, page 382-415. Editor: Mark Crocker. London, UK: Royal Society of Chemistry Publishing (ISBN-10: 1849730358).

Hansen, A.C., and B. He. 2010. Biodiesel fuels for off-road vehicles. In *Encyclopedia of Agricultural, Food and Biological Engineering*, 2nd edition, 1:114-116. Editor: Dennis R. Heldman. Taylor & Francis Group (ISBN: 978-1-4398-1111-5).

***Manuscripts Submitted to/ Prepared for Refereed Journals*:**

B. He and J. H. van Gerpen. 2012. Analyzing biodiesel for contaminants and moisture retention. *Biofuels (Under review)*.

Maglinao, R, and B. He. 2012. Optimization of glycerol *in situ* hydrogenolysis to propylene glycol and ethanol. (*drafted*).

Maglinao, R, and B. He. 2012. Propylene glycol preparation from glycerol via acetol pathway by *in situ* hydrogenation. (*drafted*).

Bi, Z., and B. He. 2012. Characterization of microalgae for biofuels production. (*in preparation*).

Wang, D., and B. He. 2012. Review of heterogeneous catalysts for hydrogenation and deoxygenation of plant oils and animal fats. (*in preparation*).

Non-Refereed Publications:

Maglinao, R, and B. He. 2010. Thermochemical Conversion of Glycerol from Biodiesel Production to Primary Alcohols. Paper # 1009267. ASABE, St. Joseph, Mich.

Maglinao, R, and B. He. 2010. Recent Developments in Chemical Processes in Converting Glycerol to Value-Added Products. Paper #1009266. ASABE, St. Joseph, Mich.

Maglinao, R. L. and B. He. 2009. Thermal Conversion of Glycerol to Primary Alcohols Using a Batch Pressure Reactor. ASABE Paper No: 09–6673. ASABE, St. Joseph, Mich.

Maglinao, R. L. and B. He. 2009. Effects of Temperature and Sulfuric Acid Levels on the Dehydration of Glycerol. ASABE Paper No: 09–6679. ASABE, St. Joseph, Mich.

Hansen, A. and B. He. 2008. Food versus Fuel Characteristics of Vegetable Oils and Animal Fats. ASABE Paper No: 08–4676. ASABE, St. Joseph, Mich.

Karsky, T., J., Thompson, and B. He. 2008. Small Scale Biodiesel Production Safety. Technical paper #08-17 Annual NIFS (National Institute For Farm Safety). June 22–26. Lancaster, Penn.

Thompson, J. and B. He. 2006. A high shear-rate static mixer reactor for biodiesel preparation. ASABE Paper No: 06–6221. ASABE, St. Joseph, Mich.

Pachauri, N. and B. He. 2006. Value-added utilization of crude glycerol from biodiesel production: a survey of current research activities. ASABE Paper No: 06–6223. ASABE, St. Joseph, Mich.

He, B., J. Thompson, D. Routt, and J. Van Gerpen. 2006. Moisture distribution in biodiesel and its

fossil diesel blends. ASABE Paper No: 06–6147. ASABE, St. Joseph, Mich.

Tao, C. and B. He. 2005. Enzymatic isolation of erucic acid from HEA oils with biodiesel as co-product. ASAE Paper No: 05–6136. ASAE, St. Joseph, Mich.

Singh, A., B. He, and J. Thompson. 2005. Experimental optimization on a continuous-flow reactive distillation reactor system via transesterification. ASAE Paper No: 05–6126. ASAE, St. Joseph, Mich.

Shrestha, D., B. He, J. Van Gerpen, C. Peterson, J. Thomson, and C. Erin. 2005. Cold flow properties of biodiesel and effect of commercial additives. ASAE Paper No: 056121. ASAE, St. Joseph, Mich.

Zawadzki, A., D. Shrestha, and B. He. 2005. Use of a spectrophotometer for biodiesel quality sensing. ASAE Paper No: 05–3133. ASAE, St. Joseph, Mich.

Soria, A., A. McDonald, S. Shook, and B. He. 2005. Supercritical methanol for conversion of Ponderosa pine into chemicals and fuels. 59th Appita & 13th International Symposium on Wood, Fibre and Pulping Chemistry. p369–374. Carlton, VIC 3053, Australia.

Thompson, J., and B. He. 2004. Chemical and physical properties of crude glycerol from biodiesel production, and its purification methods and potential uses. ASAE Paper No: PNW04–1010. ASAE, St. Joseph, Mich.

Singh, A., J. Thompson, and B. He. 2004. Function and performance of pre-reactor in biodiesel production from seed oils using reactive distillation column. ASAE Paper No: PNW04–1011. ASAE, St. Joseph, Mich.

Singh, A., J. Thompson, and B. He. 2004. A Continuous-flow reactive distillation column for biodiesel preparation from seed oils. ASAE Paper No: 04–6071. ASAE, St. Joseph, Mich.

Tao, C. and B. He. 2004. Isolation of intact glucosinolates from HEA seed meal to increase the sustainability of biodiesel utilization. ASAE Paper No: 04–6079. ASAE, St. Joseph, Mich.

Tao, C. and B. He. 2003. Preliminary investigation on glucosinolates extraction from yellow mustard meal. ASAE Paper No: PNW03–118. ASAE, St. Joseph, Mich.

He, B. and W. Su. 2003. Mixing estimation of a laboratory-scale external-loop air-lift bioreactor for fungal culture using pH tracer method. Paper No. 03–7053. ASAE, St. Joseph, Mich.

He, B., Y. Zhang, T.L. Funk, and G.L. Riskowski. 2002. Renewable energy from swine manure. Symposium of the 10th Biennial Bioenergy Conference, Bioenergy 2002. Paper No. 2148.

He, B., Y. Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 2000a. Temperature and retention time effects on oil conversion and waste reduction of swine manure using a thermochemical conversion process. Proceedings of the Eighth International Symposium on Animal, Agricultural and Food processing Wastes.p46–53. ASAE, St. Joseph, Mich.

Yin, Y., B. He, Y. Zhang, T. L. Funk, and G. L. Riskowski. 2000b. Characterization of raw oil product from thermochemical conversion of swine manure. Proceedings of the Eighth International Symposium on Animal, Agricultural and Food processing Wastes. p54–60. ASAE, St. Joseph, Mich.

He, B. Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 1999. Thermochemical conversion of swine manure: a process to reduce waste and produce liquid fuel. Paper No: 994062 ASAE, St. Joseph, Mich.

He, B. Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 1998. Thermochemical conversion of swine manure to produce fuel and reduce odor: A feasibility Study. Paper No: 994016. ASAE, St. Joseph, Mich.

Presentations and Other Creative Activities:

Invited Presentations:

Biofuels: Current Status in the U.S. National Laboratory of Biomass Power Equipment, North China Electric Power University (invited / compensated). Sept. 25, 2011.

Biofuels: Current Status in the U.S. College of Engineering, China Agriculture University (invited / compensated). Sept. 24, 2011.

Agricultural Engineering Higher Education in the United States. College of Engineering, China Agriculture University (invited / compensated). Sept. 22, 2011.

Biofuels: Current Status in the US. Petrochemical Research Institute, PetroChina, Beijing, China (invited / compensated). August 18, 2010.

Biodiesel 101: the Fundamentals. China Agriculture University, Beijing, China. August 17, 2010.

As part of the organizing committee member, attended the Sino-US Environment-Enhancing Energy (E2-Energy) Forum (an invitation only event organized and participated by universities and government agencies) and facilitated a round-table discussion. International Convention Center, Beijing, China, August 15-17, 2010.

Biodiesel & Food vs Fuel Issues. Advisory Board Meeting, Department of Physics, University of Idaho. (Invited). Moscow, ID. April 24, 2009.

Why Biodiesel. Agricultural and Biological Engineering, University of Illinois at Urbana-Champaign. (Invited). Urbana, IL. Nov. 30, 2007.

Biodiesel research and utilization in the United States. School of Chemical Engineering and Technology, Tianjin University. (Invited). Tianjin, China. June 7, 2007.

Biodiesel research and utilization in the United States. Institute of Microbiology, Chinese Academy of Sciences. (invited / compensated). Beijing, China. May 25, 2007.

Introduction to Biodiesel and Its Production and Utilization. Dow-Corning Technical Exchange Society, Dow-Corning Corporation. Saginaw, Michigan. May 3, 2007.

A High Productivity Reactor System for Biodiesel Production & Biodiesel Production and Utilization Issues. R&D Department, Dow-Corning Corporation (invited/ compensated). Saginaw, Michigan. May 3, 2007.

Biodiesel Quality. Montana Biodiesel Production Workshop, MT Department of Environmental Quality. Sidney, Mt. July 19, 2006.

Advances in Biodiesel Production Technology. Agricultural Equipment Technology Conference, ASABE. Louisville, KY. Feb. 13, 2006.

Integrated Processing of HEA Oilseeds for Value-added Products and Sustainable Biodiesel (invited / compensated). University of Illinois at Urbana-Champaign, Illinois. Feb. 5, 2006.

Recent Biodiesel Research Development at the University of Idaho. Columbia Conservation District Annual Grower Meeting. Dayton, WA. January 19, 2006.

Recent Biodiesel Research Development at the University of Idaho. Pacific Northwest Farm Forum, Spokane, WA. January 17, 2006.

Biodiesel Potential for the Inland Northwest. Presented at the *Inland Northwest Oilseed Forum.* Airway Heights, WA. Feb 10, 2005.

Biodiesel Background. Presented at the *Idaho Diesel Retrofit* sponsored by US EPA District 10. Pocatello, Idaho. Oct. 9, 2004.

Technical Conference Presentations:

Maglinao, R, B. He. 2010. Thermochemical Conversion of Glycerol to Alcohols using a Pressure Reactor. Poster presentation at the PNW ASABE Annual Meeting. Sept. 9-11. Lethbridge, Alberta, Canada.

Maglinao, R, B. He. 2010. Thermochemical Conversion of Glycerol from Biodiesel Production to Primary Alcohols. Oral presentation at the ASABE 2010 Annual International Meeting. June 20–23. Pittsburgh, PA.

Maglinao, R, B. He. 2010. Recent Developments in Chemical Processes in Converting Glycerol to Value-Added Products. Oral presentation at the ASABE 2010 Annual International Meeting. June 20–23. Pittsburgh, PA.

Thompson, J., B. He, J. Van Gerpen. 2010. Comparison of Anti-Oxidant Additives to Improve the Oxidative Stability of Methyl and Ethyl Esters Made from Various Low and High FFA Feedstocks. Poster presentation at the ASABE 2010 Annual International Meeting. June 20–23. Pittsburgh, PA.

Duff, K., J. Van Gerpen, and B. He. 2010. Investigation of Sterol Glucosides and Related Compounds in Biodiesel Production. Oral presentation at the 101st AOCS Annual Meeting & Expo. May 16–19. Phoenix, AZ.

Maglinao R.L., and B. He. 2009. Effects of Thermal Conversion of Glycerol to Primary Alcohols Using a Batch Pressure Reactor. Oral presentation at the 2009 ASABE Annual International Meeting. June 21-June 24, 2009 – Reno, NV.

Maglinao R.L., and B. He. 2009. Effects of Temperature and Sulfuric Acid Levels on the Dehydration of Glycerol. Poster presentation at the 2009 ASABE Annual International Meeting. June 21-June 24, 2009 – Reno, NV.

Duff, K., J. Van Gerpen, and Brian He. 2009. Evaluation of Acylated Sterol Glucosides (ASG) & Sterol Glucosides (SG) of the Oil Seed Crops of the Pacific Northwest A Progress Report. Oral presentation at the 100th AOCS Annual Meeting & Expo. May 3-6, 2009. Orlando, FL.

He, B., K. Huber , G. Ünlu, A. McDonald, S. Chen, B. Van Wie, R. M. Worden. 2008. Offering a Biomass & Biorefinery Curriculum to Undergraduate Seniors and Graduate Students. 2008 NACTA/SERD Conference. Abstract #34. Logan, Utah . June 11-13.

Hansen, A., and B. He. 2008. Food versus Fuel Characteristics of Vegetable Oils and Animal Fats. Oral presentation at the 2008 ASABE Annual International Meeting. June 29– July 2. Providence, Rhode Island.

Karsky, T., J.C., Thompson, and B. He. 2008. Small Scale Biodiesel Production Safety. Presentation at the Annual NIFS (National Institute For Farm Safety) Conference. Lancaster, PA. June 22–26.

He, B., A. Singh, and J. Thompson. 2007. A Novel High Productivity Reactor for Continuous-flow Biodiesel Production. Oral presentation at the International Symposium on Advanced Biomass Science and Technology. May 23–25. Beijing, China.

He, B. 2007. Offering a Biomass & Biorefinery Curriculum to Undergraduate Seniors and Graduate Students. Continuing Professional Development (CPD) #7. Workshop organizer. ASABE Annual International Meeting. June17. Minneapolis, Minnesota.

Pachauri, N. and B. He. 2007. Reversibility of Methyl Esters in Reboiler Zone of Reactive Distillation Reaction for Biodiesel Preparation via Transesterification. Oral presentation at the 2007 ASABE Annual International Meeting. June17–20. Minneapolis, Minnesota.

He, B., J. Thompson, D. Routt, and J. Van Gerpen. 2006. Moisture distribution in biodiesel and its

fossil diesel blends. Oral presentation at the 2006 ASAE Annual International Meeting. July 9–12, 2006. Portland, Oregon.

Thompson, J. and B. He. 2006. A high shear-rate static mixer reactor for biodiesel preparation. Poster presentation #066221 at the 2006 ASABE Annual International Meeting. July 9–12, 2006. Portland, Oregon.

Pachauri, N. and B. He. 2006. Value-added utilization of crude glycerol from biodiesel production: a survey of current research activities. Poster presentation #066223 at the 2006 ASABE Annual International Meeting. July 9–12, 2006. Portland, Oregon.

He, B., A. Singh, J. Thompson, and J. Van Gerpen. 2005. Comparison of Four Alkaline Catalysts and Their Kinetics for Reactor Design in Biodiesel Production. Oral presentation at the 2005 International Chemical Congress of Pacific Basin Societies. December 15–20, 2005. Honolulu, Hawaii, USA.

Tao C. and B. He. 2005. Enzymatic isolation of erucic acid from HEA oils with biodiesel as co-product. Poster presentation #056136 at the 2005 ASAE Annual International Meeting. July 17–20, 2005. Tampa, Florida.

Singh, A., B. He, and J. Thompson. 2005. Experimental optimization on a continuous-flow reactive distillation reactor system via transesterification. Poster presentation #056126 at the 2005 ASAE Annual International Meeting. July 17–20, 2005. Tampa, Florida.

Singh, A. and B. He. 2005. Modeling of a continuous-flow reactive distillation reactor system for biodiesel production via transesterification. Poster presentation #056125 at the 2005 ASAE Annual International Meeting. July 17–20, 2005. Tampa, Florida.

Shrestha, D., B. He, J. Van Gerpen, C. Peterson, J. Thomson, and C. Erin. 2005. Cold flow properties of biodiesel and effect of commercial additives. Poster presentation #056121 at the 2005 ASAE Annual International Meeting. July 17–20, 2005. Tampa, Florida.

Zawadzki, A., D. Shrestha, and B. He. 2005. Use of a spectrophotometer for biodiesel quality sensing. Oral presentation #053133 at the 2005 ASAE Annual International Meeting. July 17–20, 2005. Tampa, Florida.

Soria, J.A., A. McDonald, and B. He. 2005. Alternative chemical and fuel feedstocks from Ponderosa pine wood treated in supercritical methanol. Paper No. 54. Presented at the 2nd Int'l Conference on Green and Sustainable Chemistry and the 9th Annual Green Chemistry and Engineering Conference. June 20–24, 2005. Hotel Washington, Washington, DC.

He, B. and J. Thompson. 2004. Colorimetry of biodiesel blends for possible quick concentration detection. Presented at the 2004 PNW ASAE meeting. Sept. 23–25, 2004. Baker City, Oregon.

Thompson, J. and B. He. 2004. Chemical and physical properties of crude glycerol from biodiesel production, and its purification methods and potential uses. Presented at the 2004 PNW ASAE meeting. Sept. 23–25, 2004. Baker City, Oregon.

Singh, A., J. Thompson, and B. He. 2004. Function and performance of pre-reactor in biodiesel production from seed oils using reactive distillation column. Presented at the 2004 PNW ASAE meeting. Sept. 23–25, 2004. Baker City, Oregon.

Singh, A., J. Thompson, and B. He. 2004. A Continuous-flow reactive distillation column for biodiesel preparation from seed oils. Presented at the Annual International Conference of ASAE/CSAE. August 1–4, 2004. Ottawa, Ontario, Canada.

Tao, C. and B. He. 2004. Isolation of intact glucosinolates from HEA seed meal to increase the sustainability of biodiesel utilization. Presented at the Annual International Conference of ASAE/CSAE. August 1–4. Ottawa, Ontario, Canada.

Rule, R., B. Childs, and B. He. 2004. High temperature pressing of oils seed to deactivate enzyme of glucosinolates hydrolyzing while increasing oil yields. Presented at the Annual International Conference of ASAE/CSAE. August 1–4. Ottawa, Ontario, Canada.

Tao, C. and B. He. 2003. Preliminary investigation on glucosinolates extraction from yellow mustard meal. Oral presentation at the Pacific Northwest ASAE Meeting. Sept. 25–27. Clarkston, WA.

He, B. and W. Su. 2003. Mixing estimation of a laboratory-scale external-loop air-lift bioreactor for fungal culture using pH tracer method. Presentation at Annual International Conference of ASAE. July 27–30. Las Vegas, NV.

Soria, A., A. McDonald, and B. He. 2003. Conversion of biomass residues to chemicals and fuels using supercritical fluid technology. Forest Products Society 57th Annual Meeting. June 22–25. Bellevue, WA.

He, B., Y. Zhang, T.L. Funk, and G.L. Riskowski. 2002. Renewable energy from swine manure. Presented at the 10th Biennial Bioenergy Conference, Bioenergy 2002. Sept.22–26. Boise, ID.

He, B., Y. Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 2000a. Temperature and retention time effects on oil conversion and waste reduction of swine manure using a thermochemical conversion process. Presented at The Eighth International Symposium on Animal, Agricultural and Food processing Wastes. October 9–11. Des Moines, IA.

Yin, Y., B. He, Y. Zhang, T. L. Funk, and G. L. Riskowski. 2000b. Characterization of raw oil product from thermochemical conversion of swine manure. Presented at The Eighth International Symposium on Animal, Agricultural and Food processing Wastes. October 9–11. Des Moines, IA.

He, B., Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 1999. Thermochemical conversion of swine manure: a process to reduce waste and produce liquid Fuel. Presentation at Annual International Conference of ASAE/CSAE. July 18–21. Toronto, Ontario, Canada.

He, B., Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 1998. Thermochemical conversion of swine manure to produce fuel and reduce odor: a feasibility study. Presentation at Annual International Conference of ASAE. July12–16, Orlando, FL.

He, B., Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 1998. Thermochemical conversion of swine manure to produce fuel and reduce odor. Annual Meeting of Illinois Pork Council, March 1998, Lincoln, IL

Zhang, Y., B. J. He, Ted Funk, G.L. Riskowski, R. Mackie, L.L Christianson, M. Tumbleson and M. Fink. 1997. Thermal Depolymerization of Swine Manure to Produce Fuel and Reduce Odor: A Feasibility Study. *Proceedings of International Symposium: Ammonia and Odor Control from Animal Production Facilities*. Vinkeloord, The Netherlands, October 6–10.

Su, W. and B. He. 1995. Production of secreted proteins by fungal pellets in a perfusion bioreactor. Paper #1212, International Chemical Congress of Pacific Basin Societies, Honolulu, HI.

Su, W., B. He, and L. Fei. 1994. Application of large-solidity-ratio axial-flow impellers in high density plant cell suspension cultures. AIChE Annual Meeting, San Francisco, CA.

Web pages / Entries developed for USDA eXtension Communities of Practice pilot website:

- Reactors for Biodiesel Production (June 2009)
- Is the Crude Glycerol the Same from Biodiesel Production from Multiple Feedstocks (2009)
- Safety Considerations in Biodiesel Production (June 2009)
  - ✓ Handling Alcohols in Biodiesel Production
  - ✓ Handling Strong Acids in Biodiesel Production
  - ✓ Handling Strong Bases in Biodiesel Production

Patents:

Invention patent: US patent application/ provisional: A 61,609,971. March 13, 2012. Catalytic Conversion of Glycerol to Alcohols. Inventors: Brian He, Randy Maglinao.

Invention patent: US Patent: #5,759,942. June 2, 1998. Ion-exchange Resin Catalyst for the Synthesis of Bisphenols and the Process of Preparing the Same. Inventors: T. Qiu, Z. Jin, H. Jiang, Z. Liu, B. He (谈遒; 金祖铨; 蒋洪寿; 刘宗章; 和秉钧).

The above invention patent is also in the following countries:

a) WO 96/12555 A1, including BR, CA, JP, KR, RU, AT, BE, CH, DE, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
b) EP 0788839, including DE,ES, FR, IT, NL
c) ZA 95/08979, South Africa
d) TW 084030, Taiwan

Invention patent: CN 1,121,442,. May 1, 1996. Ion-exchange Resin Catalyst for the Synthesis of Bisphenols and the Process of Preparing the Same (合成双酚用离子交换树脂催化剂及其制备). Inventors: T. Qiu, Z. Jin, H. Jiang, Z. Liu, B. He (谈遒; 金祖铨; 蒋洪寿; 刘宗章; 和秉钧).

Invention patent: CN 1,059,480. March 18, 1992. Production Technology and Apparatus of Ion-exchange Resin Catalyst for in Bisphenols Synthesis (合成双酚用离子交换树脂催化剂的制取工艺及其装置). Inventors: Z. Jin, B. He, H. Jiang, Z. Liu (金祖铨; 和秉钧; 蒋洪寿; 刘宗章).

Invention patent: CN 1,061,354. May 27, 1992. 合成双酚用离子交换树脂催化剂的制取装置 (Apparatus for Sulfonation of Ion Exchange Resin Catalyst for Synthesis of Bisphenol A). Inventors: Z. Jin, B. He, H. Jiang, Z. Liu (金祖铨; 和秉钧; 蒋洪寿; 刘宗章).

Grants and Contracts Awarded *(approx. $3.5M since 2001)***:**

National biodiesel education program (Phase 2). $800,000. USDA Biodiesel Fuel Education Program. 10/08 –09/12. Jon Van Gerpen, Brian He (co-PI), Doug Haines, Dev Shrestha.

Implementation of Biofiltration Technology. $328,328. USDA Natural Resources Conservation Service. 09/2011-08/2013. Lide Chen, Howard Neibling, Brian He (co-PI), Mario Emanuel DeHaro Marti.

In situ Transesterification of Microalgal Oil to Produce Algal Biodiesel. $57,000 (KLK 768). National Institute for Advanced Transportation Technology. 08/11 – 12/12. Brian He (PI).

Multiple Enhanced-value Co-products from Regionally Important Oilseed Feedstocks. $599,210. USDA National Institute of Food and Agriculture Research. 07/2011-12/2014. M. Morra, Brian He (co-PI), C. Nindo.

Production of Renewable Diesel Fuel from Biologically-based Feedstocks. $160,000 (Year 1 $70,000, KLK766; and Year 2 $90,000, KLK 766). National Institute for Advanced Transportation Technology. 08/10 – 08/12. Jon Van Gerpen, Brian He (co-PI).

Continuous-Flow Reactor System for Improved Catalytic Glycerol Conversion. $55,000 (KLK 765). National Institute for Advanced Transportation Technology. 08/10 – 12/11. Brian He (PI).

Biobased Energy Educational Material Exchange System (BEEMS). $59,800 (BFK 382). 10/09 – 09/12. USDA Higher Education Challenge Grants (grant #2009-38411-19761). Brian He (PI). Collaborated as a sub-contract with Ohio State University and other 3 universities. The total project award was $459,867.

Application of Metal Catalysts for High Selectivity of Glycerol Conversion to Alcohols. $50,000 (KLK 758). 08/09 – 12/10. National Institute for Advanced Transportation Technology. Brian He (PI).

Measurement and Control Strategies for Sterol Glucosides to Improve Biodiesel Quality. $145,195 ($75,195 for Year 1, KLK 755; $70,000 for Year 2, KLK759). National Institute for Advanced Transportation Technology. 08/08 – 12/10. Jon Van Gerpen, Brian He (co-PI).

Thermal processing of low-grade glycerol to alcohols for biodiesel production $141,171 ($78,092 for Year 1, KLK 750; $63,079 for Year 2, KLK 754). 08/07 – 12/09. National Institute for Advanced Transportation Technology. Brian He (PI).

Washington State Ferries Biodiesel Utilization Project. $68,171. US DOE through Puget Sound Clean Air Agency. 01/07 – 01/09. Brian He (PI), Jon Van Gerpen. Collaborated with Washington State University. The total project award was $299,950.

A Sulfur Analyzer for Ultra-low Sulfur Analysis and Biodiesel Quality Control. $18,000 ($10,000 by NIATT and $8,000 from PNW Canola/Rapeseed Commission). 08/07 – 07/08. Jon Van Gerpen, Brian He (co-PI), Dev Shrestha, Joe Thompson.

Biodiesel Quality Affected by Sulfur Content Originated from Different Feedstocks and A Database for the Same. $59,327 (KLK 432). National Institute for Advanced Transportation Technology. 08/06 – 12/07. Brian He (PI), Jon Van Gerpen.

A virtual education center for biorenewable resources: building capacity and humanizing distance education. $122,500. USDA Higher Education Challenge Grants. 10/06 –09/09. Jon Van Gerpen, Brian He (co-PI). Collaborated with Iowa State University (the lead institution) and University of Kentucky. The total project award was $489,929.

Feasibility study on hydro-thermal conversion of low-grade glycerol to alcohols for use in biodiesel production. $51,230 (KLK 412). National Institute for Advanced Transportation Technology. 08/05–08/07. Brian He (PI).

A biodiesel demonstration plant. $68,818 (KLK 421). National Institute for Advanced Transportation Technology. 08/05 – 08/07. Jon Van Gerpen, Brian He (co-PI).

Travel grant to *Pacific Chem 2005* at Honolulu, HI. $900. University Research Council. 09/05. Brian He (PI).

Curriculum development: biorefinery process analysis and design. $284,009. USDA Higher Education Challenge Grants (award/contract #2004-38411-14743). 10/04 –09/07. Brian He (PI), Charles Peterson, Kerry Huber, Gulhan Yuksel, Armando McDonald.

A gas chromatograph for biodiesel analysis and quality control. $12,000. National Institute for Advanced Transportation Technology. 11/04. Brian He (PI), Jon Van Gerpen, Chuck Peterson, Dev Shrestha, Joe Thompson.

A novel continuous-flow reactor using reactive distillation technique for economical biodiesel production – stage 2. $68,743 (KLK 340). National Institute for Advanced Transportation Technology. 09/04 – 08/05. Brian He (PI).

FTIR spectroscopy for wood and bioproduct research. $24,006. USDA NRI. 07/04. Armando G. McDonald, Brian He (co-PI).

National biodiesel fuel education program. $950,000. USDA Biodiesel Fuel Education Program. 10/03 –09/08. Charles Peterson, Jon Van Gerpen, Brian He (co-PI), Doug Haines, Dev Shrestha.

A novel continuous-flow reactor using reactive distillation technique for economical biodiesel production. $45,000 (KLK343). National Institute for Advanced Transportation Technology. 09/03 – 08/04. Brian He (PI), Charles Peterson.

Comparative studies on bacteriocins from lactic acid bacteria that are active against *Listeria monocytogenes* and *Staphylococcus aureus* and the use of these bacteriocins as powdered biopreservatives in the dairy industry. $29,740. United Dairy of Idaho. 01/01/03-12/31/04. Gulhan Yuksel, Dong-Hyun Kang, Brian He (co-PI).

Feasibility study of reactive distillation for continuous-flow biodiesel production. $18,000. Idaho Rapeseed/Canola Commission. 08/03 – 07/04. Brian He (PI), Charles Peterson, Jack Brown.

Comparison of esterified and non-esterified oils from rapeseed, Canola, and yellow mustard as diesel fuel additives. $50,000. National Institute for Advanced Transportation Technology. 09/02 – 08/03. Charles Peterson, Brian He (co-PI).

Isolation of Toxic chemicals from seed meals for value-added animal feed and biopesticides. $7,948. Seed Grant, Research Council of the University of Idaho. 07/02 – 06/03. Brian He (PI).

Travel Grant to *Bioenergy 2002* at Boise. $690. University Research Council. 09/02. Brian He (PI).

Comparative Studies on bacteriocins from Lactic acid bacteria that are active against *L. monocytogenes* and *S. aureus*. $34,664. United Dairy of Idaho. 01/02–12/ 02. Gulhan Yuksel, Dong-Hyun Kang, Brian He (co-PI).

Honors and Awards:

Most influential faculty member, Alumni Associate, University of Idaho; nominated by Joshua Schroeder, recipient of 2009 Alumni Award for Excellence.

Superior Paper Award. American Society of Agricultural and Biological Engineers (ASABE). 2007. First & corresponding author. [He, B., A. Singh, and J. Thompson. 2006. A novel continuous-flow reactor using reactive distillation technique for biodiesel production. *Trans. ASABE* 49(1): 107−112].

Faculty Excellence Award. Naval ROTC at UI/WSU. 2007.

Nominee, R.M. Wade Excellence in Teaching award. College of Agricultural and Life Sciences, University of Idaho. 2006.

Teacher of the Year. Biological and Agricultural Engineering, UI. 2006.

Nominee, R.M. Wade Excellence in Teaching award. College of Agricultural and Life Sciences, University of Idaho. 2004.

Teacher of the Year. Biological and Agricultural Engineering, UI. 2004.

Superior Paper Award. American Society of Agricultural Engineers (ASAE). 2001. First & corresponding author [He, B., Y. Zhang, Y. Yin, T. L. Funk, and G. L. Riskowski. 2000b. Operating temperature and retention time effects on the thermochemical conversion process of swine manure. *Trans. ASAE* 43(6):1821–1825].

Gamma Sigma Delta, Honor Society of Agriculture. Inducted in 1998.

Alpha Epsilon, Agricultural Engineering Honor Society. Inducted in 1997.

SERVICE

Major Committee Assignments:

University level:

Member	*Faculty Affairs Committee* – 1640.42	(2011 –2014)
Member	*Distinguished Professorship Advisory Committee* (appointed)	(2010 –2011)
Chair	*Sabbatical Leave Evaluation Committee* - 1640.74	(2010 –2011)
Member	*Sabbatical Leave Evaluation Committee* - 1640.74	(2008 –2011, Fall 2011)

College level:

Member *P&T committee, College of Agricultural and Life Sciences* (CALS)
- Second term (2008 – 2011; Fall 2011)
- First term (2003 – 2006)

Member CALS Awards Committee
- for Outstanding Junior (Mar. 2011)
- for Outstanding Sophomore (Mar. 2009)
- for Outstanding Office Support (Mar. 2011; Mar. 2007)

Member *Search committee, Bioenergy/Bioproducts Technical Liaison, Plant, Soil and Entomological Sciences / Biological and Agricultural Engineering* (2007)

Member *Search committee, Associate Dean and Director of ID Agricultural Experimental Station, College of Agricultural and Life Sciences* (Oct. 2003)

Departmental:

Member *Graduate Program Committee* (2005 – date)

Member *P&T Policy Committee* (2002 – date)

Member *Faculty Member Promotion Review Committee*
- for Dr. Bradley King (2005)

Chair *Faculty Member Tenure and Promotion Review Committee*
- for Dr. Dev Shrestha (2009)

Member *Faculty Member Third-year Review Committee*
- for Dr. Dev Shrestha (2005)
- for Dr. Barbara Williams (2003)

Member *Bioenergy Specialist search Committee*
- Second round/ reopen (2003)
- First round (2002)

Professional and Scholarly Organizations:

Member and facilitator, *Organizing Committee, Sino-US Environment-Enhancing Energy (E^2-Energy) Forum*. International Convention Center, Beijing, China, August 15-17, 2010.

Chair *ASAE Standards review committee*, ASAE EP552.1, Reporting of Fuel Properties when Testing Diesel Engines with Alternative Fuels Derived from Plant Oils and Animal Fats, covers the reporting of testing of any alternative fuels derived from plant oils and their blends with petroleum diesel for use in diesel engines (2008 – 2010).

Coordinator *WORKSHOP H: Engineering a New Bioenergy Industry, Bioenergy Engineering Conference* (Bellevue, WA, 2009).

Co-Chair *ASABE, Pacific Northwest Section* (2006 – 2007)

Member ASAE Cooperative Standards committee, ASAE X593: *Terminology and Definitions for Biomass Production, Harvesting and Collection, Storage, Processing, Conversion and Utilization* (2004 – 2005).

Member *American Society of Agricultural and Biological Engineers* (ASAE/ASABE) (1994 – date)

Member *FPE 709 Bioenergy and Industrial Products Committee*, ASAE/ASABE (2003 – date)

Member *FPE 703 Food Processing Committee*, ASAE/ASABE (2003 – 2009)

Member *BE 28 Biological Engineering Committee*, ASAE/ASABE (2003– 2009)
Coordinator *Student Activity, ASAE Pacific Northwest Section* (2003 – 2004)
Member *American Institute of Chemical Engineers* (AIChE) (1995 – 2003)

Journal Editorship:

Associate Editor *Transactions of the ASAE/ASABE (2004 – date)*
Associate Editor *Applied Engineering in Agriculture (2004 – date)*

Panelist/Reviewer, Grant Proposal Reviews:

Panelist *US NSF Partnerships for Innovation (2011)*
Panelist *Minnesota Renewable Energy and the Environment (2010, 2011)*
Reviewer *Renewable Energy Program, North Dakota Industrial Commission (2010, 2011)*
Reviewer *USDA CSREES/NIFA SBIR program (2005-2011)*
Panelist *Research Competitiveness Program, American Association for the Advancement of Science (AAAS) (2010)*
Panelist *US DOE Bioenergy Manufacturing Tax Credit (48C) Program (2009)*
Panelist *USDA CSREES SBIR program (2007, 2008)*
Reviewer *EPSCoR Proposal to NSF, University of Vermont (2009)*
Reviewer *SEEDS: The OARDC Research Enhancement, Ohio State University (2008, 2009)*
Reviewer *National Institute of Standards and Technology (NIST) (2008)*
Reviewer *Waste Management and Research Center, Illinois Department of Natural Resources (2008)*
Reviewer *USDOE Small Business Initiative Research (SBIR) & Small Business Technology Transfer (STTR) Program (2007)*
Reviewer *Kentucky Science and Engineering Foundation R&D Excellence Program (2006)*
Reviewer *Michigan 21st Century Jobs Fund (2006)*
Reviewer *Minnesota Renewable Energy and the Environment (2005)*

***Ad hoc* Reviewer for technical journals:**

Applied Engineering in Agriculture
Biomacromolecules
Bioresource Technology
Biotechnology and Bioengineering
Chemical Engineering Communications
Chemical Engineering & Technology (Germany)
International Journal of Food Science and Technology
Energy & Fuels
Energies
Environmental Progress
Environmental Science and Technology (ACS)
Fuel
Global Bioenergy
Industrial and Engineering Chemistry Research
Journal of Applied Microbiology
Journal of Bioscience and Bioengineering

Journal of International Agricultural and Biological Engineering
Transactions of the ASABE

***Ad hoc* Reviewer for Grant Proposals:**

USDA Cooperative State Research, Education, and Extension Services (CSREES)
USDA Small Business Initiative Research (SBIR)
USDOE Small Business Initiative Research (SBIR) &
Small Business Technology Transfer (STTR) Program
Technology Foundation STW, the Netherlands Organization for Scientific Research and the Dutch Ministry of Economic Affairs

PROFESSIONAL DEVELOPMENT

Teaching:

Attended the North American Colleges and Teachers of Agriculture (NACTA) annual conference. June 11-13, 2008. Logan, Utah.

Workshop on Developing and Teaching Online Courses and Distance Education. University of Idaho Commons. Sponsored by UI Office of Academic Affairs and the Teaching Enhancement Committee. Sept. 15, Oct. 11, Nov. 3, and Dec. 10, 2004.

Workshop on Research in Engineering Education. Whitewater Room, University of Idaho Commons. May 1, 2003. Sponsored by NSF and UI.

Teaching institute: Improving Teaching and Learning – A Process Approach for Engineering Education. University of Idaho. June 9–11, 2003. Sponsored by Enriched Learning Environment Project, Transferable Integrated Design Engineering Education Consortium, UI, and WSU.

New Faculty Teaching Workshop. Whitewater Room, University of Idaho Commons. Aug. 24, 2001.

Teaching College (10-week course).University of Illinois at Urbana-Champaign. Fall 1999 (certificate).

Scholarship:

National Institute of Food and Agriculture Workshop - Planning and Managing Systems Based Trans-disciplinary Projects for USDA/NIFA Programs. Live on-line video stream. Sept. 8, 2010. Washington State University, Pullman, WA.

Bioenergy Engineering 2009. Bellevue, WA. Oct. 11-14, 2009. Sponsored by ASABE, and co-sponsored by BBI International, ASCE, and 25x'25 America's Energy Future. The qualified professional development hours include:

- Workshop A: Preprocessing and conversion for thermochemical conversion of biomass (3.25 h)
- State of the Union, how the new administration and political influences affect the future of bioenergy (1.75 h)
- Technologies for harvest and collection of woody biomass (1.5 h)
- Thermochemical conversion of biomass to energy (1.5 h)
- Emerging technologies: the future of biofuel production (1.5 h)
- Thermochemical process engineering (1.75 h)
- Workshop H: Engineering a new bioenergy industry (3.5 h)

Bioenergy Planning Workshop, sponsored by the Center for Advanced Energy Studies (CASE),

Idaho National Laboratory. Best Western Inn, Moscow, ID. Sept. 2, 2009.

Attended and presented at the ASABE Annual International Meeting. June 29– July 2, 2008. Providence, Rhode Island.

Attended USDA Science and Education Resources Development (SERD) Project Director Workshop. June 10, 2008. Logan, Utah.

Sabbatical leave. Project on "Development of Course Materials for Offering A New Course of Biomass Thermochemical Conversion Technologies". Aug. 13, 2007 – May 16, 2008.

Co-organized the 2007 PNW ASABE/CSBE Annual International Meeting. Sept. 13–14, 2007, Moscow, Idaho.

Attended and presented at the ASABE Annual International Meeting. June17–20, 2007, Minneapolis, Minnesota.

Attended and presented at the ASABE Annual International Meeting. July 9–12, 2006, Portland, Origen.

Writing Competitive Proposals. Office of Sponsored Programs, University of Idaho. October 19, 2005.

Grantsmanship Workshop. USDA-CSREES. Sept. 28–29, 2005. Moscow, ID.

Attended the 2005 PNW ASAE Annual International Meeting in Lethbridge, AB, Canada.

Annual International Conference of ASAE. 2005. Tampa, FL.

Annual International Conference of ASAE. 2004. Ottawa, ON, Canada.

Annual International Conference of ASAE. 2003. Las Vegas, NV.

Bioenergy 2002 Conference. Sept.22–26, 2002. Boise, ID.

Scholarly Writing Workshop on proposal preparation for external grants. Research Office, University of Idaho. March 15, 2002.

Annual International Conference of ASAE. 2001. Sacramento, CA.

Eighth International Symposium on Animal, Agricultural and Food processing Wastes. October 9–11, 2000. Des Moines, IA.

Annual International Conference of ASAE/CSAE. July 18–21, 1999. Toronto, Ontario, Canada.

Annual International Conference of ASAE. July12–16, 1997, Orlando, FL.