



CURRENT CHALLENGES IN COMMERCIAL PRODUCTION OF CELLULOSIC ETHANOL

(Course Code:176021H04)

(8th October - 13th October, 2018)

Sponsored by
Ministry of Human Resource Development (MHRD)
under
the scheme Global Initiative for Academic Network (GIAN)



Organised by
Department of Microbiology
Maharshi Dayanand University,
Rohtak-124001, Haryana,
INDIA

CURRENT CHALLENGES IN COMMERCIAL PRODUCTION OF CELLULOSIC ETHANOL

MHRD Scheme on Global Initiative on Academic Network (GIAN)

1. Overview

Cellulosic ethanol is one of the most promising renewable biofuels alternative to gasoline. It is recently noted that the ethanol would be mixed into the rocket fuel in Japan and US. In later 2016, it was reported Alaska Airlines would fly the first commercial flight with cellulosic renewable jet fuel. However, until now, there are a number of technical challenges that hinder the industrial production of ethanol from lignocellulosic biomass. The speaker has been working on the bioconversion of cellulose since 2003, and has managed a pilot ethanol plant in Huadu, Guangzhou during 2012~2014. He concluded the major technical barriers are: (1) High-solids operation, for example, over 35% solids consistency is loaded initially and more than 10%(v/v) fermentation broth is obtained finally. This may cause severe rheological problems; (2) High-temperature-resistant yeast or low-temperature enzymes which facilitate the simultaneous saccharification and fermentation; (3) Co-fermentation of glucose and xylose which may promote the economic significance of overall biomass conversion; (4) Recovery of enzymes and yeast cells to lower the single-cycle input. The speaker is also looking for potential cooperation chance in India.

The major goal of this course is to understand the current technical challenges involved in the industrialization of cellulosic ethanol and to explore possible solutions. This course is designed in two Modules where as the Module 1 deals with the conventional processes including feedstocks management, pretreatment and enzymes for saccharification. Whereas in Module 2 the material, the concept and progress of consolidated bioprocessing that combines enzyme production, cellulose hydrolysis, and fermentation into a single process. Engineered yeasts and other microbes will be focused on throughout this Module. The main topics of above course will focus on innovation and industrial applications of novel protein hydrolysates through active participation and learning materials. The case studies are designed to gain experience in further understanding and applying this technology not only in biomass technology but microbiology and enzymology. The participants are welcome to bring research ideas of their own and discuss on the technology development and future collaborations.

2. Objectives

The primary objectives of the course are as follows:

- (a) Exposing participants to briefly overview the development of cellulosic ethanol, current technical bottlenecks and possible solutions.
- (b) Building in confidence and capability amongst the participants in the application of the course.
- (c) Providing exposure to practical problems and their solutions, through case studies and live projects.
- (d) Enhancing the capability of the participants to identify, control and remove the cellulosic ethanol related problems.

3. Course Details

3.1 Duration:

October 8, 2018 to October 13, 2018

3.2 Lecture Schedules

Day 1 (8 October, 2018)

Lecture 1 : 10:00 to 11:00

Introduction to biorefinery

Lecture 2 : 11:30 to 12:30

Surpass Novozymes

Tutorial 1 : 14:30 to 16:30

Tutorials based on Introduction to biorefinery, Engineered microbes for cellulosic ethanol Co-fermentation of glucose and xylose.

Day 2 (9 October, 2018)

Lecture 3 : 10:00 to 11:00

Consolidated bioprocessing (I)

Lecture 4 : 11:30 to 12:30

Consolidated bioprocessing (II)

Tutorial 2 : 14:30 to 16:30

Tutorial based on above

Day 3 (10 October, 2018)

Lecture 5 : 10:00 to 11:00

Concepts of Co-culturing I

Lecture 6 : 11:30 to 12:30

Non-yeast microbes I

Tutorial 3 : 14:30 to 16:30

Tutorial based on above topics

Day 4 (11 October, 2018)

Lecture 7 : 10:00 to 11:00

Concepts of Co-culturing II

Lecture 8 : 11:30 to 12:30

Microbial systems biology & metabolic Engineering of bioethanol producing microbes

Tutorial 4 : 14:30 to 16:30

Tutorial based on above

Day 5 (12 October, 2018)

Lecture 9 : 10:00 to 11:00

Cellulosic ethanol and its potential applications, techniques and opportunities

Lecture 10: 11:30 to 12:30

Cellular machinery for biotethanol production

Tutorial 5 : 14:30 to 16:30

Conceptualization about novel techniques in cellulosic bioethanol production.

Date of Examination: October 13, 2018

4. Who can attend

- Executives, engineers and researchers from manufacturing, service and government organizations including R&D laboratories.
- Students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.

Fee Structure

The participation fees for taking the course is as follows:

Participants from abroad : US \$300

Industry Participants: INR 8,000/-

Faculty: INR 4,000/-

Students: INR 2,000/- (OBC/UR); INR 1,000 (SC/ST)

The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The paid hotel/ guest house accommodation may be provided with prior request.

Foreign Faculty



Dr. Hao Liu is an Associate Professor in the State Key Laboratory of Pulp and Paper Engineering, South China University of Technology. His research covers a range of enzymatic cellulose hydrolysis, enzyme-assisted pulp bleaching and refining, direct fermentation of lignocellulose to ethanol, focusing on lignocellulytic enzymes including cellulases, xylanases and laccases. He is now a consultant and a co-project-manager working for Zaozhuang Jienuo Enzyme Co., Ltd., managing facilities that could produce 120 t / week crude enzyme broths. Dr. Liu has dedicated to industrial enzymes and related biotechnology since 2002. He obtained his PhD in 2011 at South China University of Technology, focusing on thermochemical pre-treatment and enzymatic hydrolysis of woody biomass. During 2008-2010, he studied in Department of Biological Systems Engineering, University of Wisconsin at Madison as a visiting scholar, working on the mechanism of lignin-cellulase non-productive binding.

Course Coordinator



Prof. Pratyosh Shukla is currently working as Head, Department of Microbiology at Maharshi Dayanand University, Rohtak, India. He was awarded with Indo-USA Professorship at University of Cincinnati, USA. He was awarded with NRF-DUT Post Doctoral Fellowship during 2008-2009 in Enzyme Technology at Durban University of Technology, Durban. His research areas include enzyme technology and protein bioinformatics. He has 16 years research and 18 years of teaching experience in reputed universities of India and abroad. He has written six Books, twenty book chapters, one patent, published more than 100 peer reviewed international publications in reputed SCI journals like Trends in Biotechnology, Frontiers in Pharmacology, Frontiers in Microbiology, Biotechnology for Biofuels, Critical Reviews in Biotechnology, Critical Reviews in Microbiology, Frontiers in Plant Sciences, PLOS One, RSC Advances etc. He has written 7 books which are published by Springer including Editor for Springer Briefs in systems biology series. He has carried out more than 8 R&D projects funded by national and international agencies as PI/Co-PI.

Course Coordinator

Prof. Pratyosh Shukla

Professor and Head
GIAN Course Coordinator
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Local Coordinator

Prof. J.P Yadav

Department of Genetics
M.D University, Rohtak 124001
Haryana India

How to Participate:

- Register yourself on GIAN Portal of IIT Kharagpur (<http://www.gian.iitkgp.ac.in/GREGN/index>)
- Choose the course i.e. "CURRENT CHALLENGES IN COMMERCIAL PRODUCTION OF CELLULOSIC ETHANOL" by drop down menu.
- Fill the registration form and pay the course by DD/Cheque/RTGS
- Scan filled Registration form and send to course coordinator



Government of India
Ministry of Human Resource
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REGISTRATION FORM

PERSONAL DETAILS

Name of the Applicant :

Designation :

Institution Address :

E-mail :

Mobile Number :

Paste recent
passport size
coloured
photograph

REGISTRATION FEE DETAILS

By Cheque

Amount (INR) :

Account Number :

Account Holder's
Name :

Cheque No. & Date :

By NEFT

Amount (INR) :

Account Number :

Account Holder's
Name :

Transaction ID & Date :

By Demand Draft

Amount:

DD No.

Bank:

Date:

Signature

Note:

- Registration should be made in favour of **GIAN, M.D University, Rohtak A/c** via **cheque/online transfer mode only**. (Bank Name & Address: State Bank of India, Rohtak, Pin-124001; Account no. 37868756829; MICR 124002008; IFSC SBIN0004734)
- Proof of Registration fee should be sent to Prof. Pratyosh Shukla, Department of Microbiology Maharshi Dayanand University, Rohtak-124001, Haryana
- The scanned copy of filled Registration form duly signed by the applicant along with the proof of fee submission should also be sent by E-mail to Prof. Pratyosh Shukla (hod.microbiology@mdurohtak.ac.in)
- In case the candidate requires an accommodation a separate E-mail regarding this should be sent to hod.microbiology@mdurohtak.ac.in before **8th September, 2018**.

Contact Person:

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Course Coordinator (GIAN Course); email - hod.microbiology@mdurohtak.ac.in

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