



**Sardar Swaran Singh National Institute of Bio Energy, Kapurthala
(An Autonomous Institution of Ministry of New and Renewable Energy)**

Message from The Secretary, MNRE



As you all are aware, our Hon'ble Prime Minister, Shri Narendra Modi, has set us the challenging goal of 24x7 affordable "power for all" in an environment friendly manner. The renewable energy sector is critical to achieve this vision. SSS-NIBE is an up-coming R&D institute with its mandate to carry out state-of-the-art R&D and innovations, covering the entire spectrum of bioenergy leading to commercialization of technology and their integration with other renewable energy technologies. There is a need for publications that can help to connect and provide such information to key stakeholders in the bioenergy space. I am glad to inaugurate SSS-NIBE first edition of quarterly newsletter which is going play vital role in promoting the renewable sector. I convey my best wishes for successful edition and wish it all success for the future.

With best wishes,

Sh. Bhupinder Singh Bhalla (IAS)
Secretary MNRE, Government of India

Word from Director General, SSS-NIBE



I feel extremely happy to present to you the first edition of SSS-NIBE newsletter. It provides a means of communication by highlighting the major research achievements, collaborations and extra curriculum activities in the institute. In the past three months, we have been keeping busy with various R&D activities, national training programs and other events. The special highlight of this period was National training program on Biogas technology and Recent advancements and techno-Economic aspects of renewable energy technologies. SSS-NIBE is also involved in research in a good number of projects focused on bio-energy. In our endeavors to recruit the best scientists, our family at the SSS-NIBE has grown this year. It is indeed my privilege to take over as the Director General of this prestigious Institute. This has indeed been a great and eventful year so far and as always; we look forward to more exciting opportunities in the future. I congratulate the scientist, staff and researchers for their efforts to achieve excellence and wish them all the best for the future. Your comments and suggestions are welcome to make the next issue of the newsletter more communicative.

With warm regards,

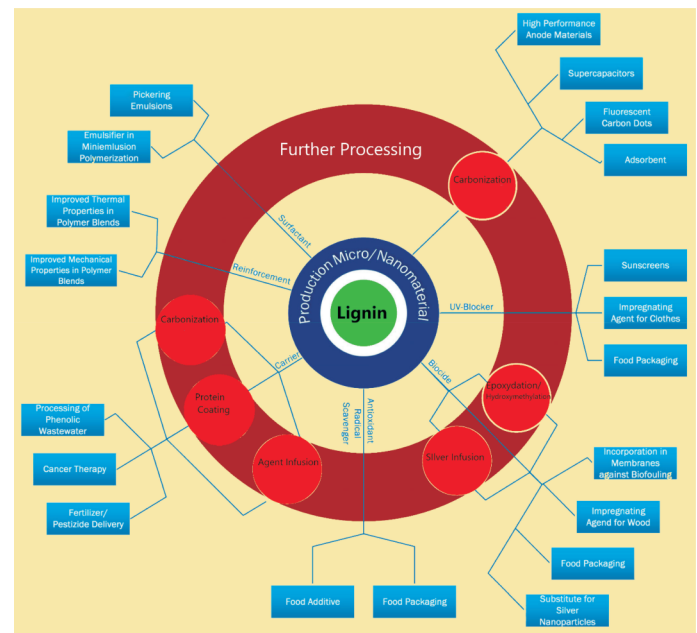
Dr. G. Sridhar
(Director General)
SSS-NIBE

Research and Innovation

Perspectives of biomass based lignin to value added chemicals in biorefineries: challenges, extraction strategies and applications

Lignin transformation has significant potential to produce high-quality platform chemicals and value-added products. Extraction techniques and techniques for processing lignin to lignin-derived dimers and trimers and other phenolic compounds have recently attracted the attention of the scientific community. Exploring the potential of the most abundant sources of bio-aromatics enhances the profitability and efficiency of the biorefinery process and reduces dependence on conventional resources. Successful lignin transformation entails the development of steps to overcome the following challenges: (i) the pretreatment of biomass followed by the separation of lignin to reduce crystallinity, and the reduction of the complex chemistry of biomass to produce lignin with a high degree of purity, and (ii) advances in chemical analysis for precise in situ lignin characterization during depolymerization. To bring about technological advances in the bio-based economy, the utilization of sustainable resources for the production of value-added products is essential. The valorization of lignin via cost-effective and carbon-neutral techniques has provided remarkable opportunities, including opportunities for commercialization. The life cycle analysis of

lignin valorization to manufacture value-added products from surplus biomass is central if maximum use is to be made of agro-residues for such purposes.

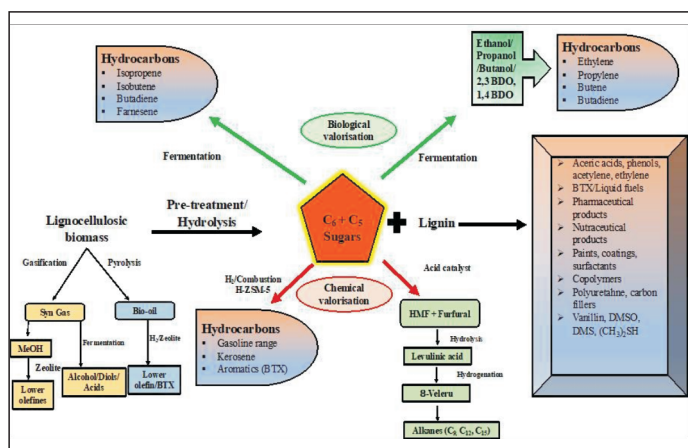


Lignin based biorefinery

Biorefining of lignocellulosic biomass for bioenergy and biochemical

The constantly increasing global energy demand is currently fulfilled by fossil fuels and their derived chemicals causing enormous emissions of pollutants including green-house gases after their combustion. Further, the expenses of a petroleum refinery are very high due to the dependence on the import of oil from other countries. Moreover, these non-renewable fossil fuels and petrochemicals are continuously depleting, and will not be available for coming centuries thus, causing the

investigation of alternative renewable resources for fulfilling the needs of man-kind. To combat these issues, the lignocellulosic wastes or biomass could be the excellent resource of renewable energy, chemicals, synthetic fibers and plastics, due to their vast variety, plentiful availability, cheaper costs, non-competitiveness with food or other essential resources, high energy content, evenly distributed throughout the country, etc. The vast world-wide production (180 billion tons per annum), and a promising energy feedstock for centuries, are the key features of biomass to set-up a biorefinery for a huge variety of products including fuels and chemicals.



Holistic approach for biomass refinery

There is a huge potential to develop a biomass-based refinery in developing countries like India, which produces more than 750 million tons of agricultural waste annually. Being the 3rd largest rice producing state with the production of about 12 million tons, Punjab generates more than 18 million tons of paddy

straw. The open burning of biomass releases harmful pollutants including green-house gases into the atmosphere leading to the environmental pollution. Paddy straw-based refinery for renewable energy carriers and other value-added products is an outstanding choice from economical as well as environmental perspectives. Products from paddy straw, have gained attention since the last few years.

A similar concept of integrated refinery has been adopted and being developed at SSS-NIBE for the generation of different valuable-products from agricultural waste such as paddy straw and bagasse like biogas, hydrogen, ethanol, xylitol, lignin, silica, vanillin and many more. SSS-NIBE has developed an efficient technology for biogas and ethanol production from paddy straw, for its application in transportation, electricity production and cooking. The developed technology has also potential to be utilized for Napier grass, banana pseudostem, water hyacinth, kitchen waste, mandi waste, municipal solid waste, etc. The developed technology has potential to produce about 275 L of ethanol from 1 ton of rice straw/bagasse. This kind of integrated biorefinery of biomass leads to the cleaner production of multiple products such as biofuels, industrial chemicals, and sustainable management of largely produced wastes rather than uncontrolled burning valuable residues like paddy straw.

News and Events

National training program (Biogas technology its implementation)

SSS-NIBE organized one-week hands on training program on Biogas technology and its implementation during 17th to 21st October, 2022. The training program was inaugurated by Dr. G. Sridhar, Director General, SSS-NIBE in the gracious presence of our Guest of Honour Dr. VK Garg, Dean, Central University of Punjab with prayer of Maa Sarsawati. Furthermore, Dr. Sachin Kumar, Scientist-C, SSS-NIBE was felicitated for recognition among 2% of the scientist around the world by Dr. G. Sridhar, Director General, SSS-NIBE.

Training Program: A National Training Program on 'Renewable Energy Technologies: Recent advancements and Techno-Economic aspects'

A National Training Program on 'Renewable Energy Technologies: Recent advancements and Techno-Economic aspects' was organized at the Institute from 28th November to 1st December 2022. The program was designed to introduce the importance of different applications of renewable energy including solar, wind and bioenergy, off-grid and grid power generation, financing for industrial projects, and techno-economics and policies for renewable energy.



National training program on Biogas technology its implementation

Prof. Manoj Kumar, Vice Chancellor DAV University was invited as the chief guest and he delivered the inaugural address on 28th November 2022. Participants from diverse backgrounds including state nodal agencies, academia, KVIC, and industry etc attended the training.



National Training Program of Renewable Energy Technologies

Guest visit by Sh. Shibananda Dash, CEO, NIT Jalandhar Technology Business Incubator

Sh. Shibananda Dash, CEO, NIT Jalandhar Technology Business Incubator visited the institute on 09/12/2022 and shared their work on the promotion of entrepreneurship among student community at NITJ. SSS-NIBE discussed the possibility of using this incubator facility for the promotion of in-house developed technologies for commercialization and providing technical mentorship to startup companies. Subsequently, the developed technologies were witnessed and further discussions are ongoing.

Guest Lecture from Mr. Ravi Madan and Dr. Rodrido Wayland Chile

Mr Ravi Madan entrepreneur from Mumbai, India along with Dr Rodrigo Wayland from Chile, visited the institute on 22/11/2022 and discussed the utilization of cactus for bioenergy applications. Dr Wayland informed that the cactus variety of their produce is highly valued for efficient biogas production and is willing to supply the same for cultivation in India. Mr. Madan shared that they have developed leather from Indian varieties of cactus and fodder for cows. In the meantime he is also desirous to know the biogas yield from the Indian cactus variety

and dung obtained from the feeding of this cactus, and agreed to send samples to our institute for further investigations.

Hindi Quarterly Meeting

The 4th Hindi meeting was organized at the Institute on 23-11-2022 under the chairmanship of Director General in the meeting room. Sh. V K Aggarwal (Hindi Expert), MNRE was invited to attend this meeting. Under his guidance and expertise in Hindi the meeting was successfully accomplished.

Lecture on "Hindi ka Vastvik Swaroop" by Dr. Rajesh Prashad Mishra, Retired General Manager (Rajbhasha) NTPC

The Hindi Division of the institute organized a lecture on "Hindi Ka Vastvik Swaroop" on 23/12/2022 at 2:00 pm via online mode. On this occasion, the guest speaker Dr. Rajesh Prashad Mishra, Retired General Manager (Rajbhasha) NTPC delivered a lecture on the global relevance of Hindi.



Vigilance awareness week celebration

Vigilance Awareness Week was observed/celebrated in the institute during 31st October, 2022 to 6th November, 2022. Different events were organized like Quiz, debate and slogan competition. On this occasion, Sh. R K Verma (Chief Vigilance Officer), Rail Coach Factory, Kapurthala was invited to deliver a lecture on vigilance awareness and all the staff of SSS-NIBE actively participated in the events.

Ministry of New and Renewable Energy organizes seminar on “National Bio Energy Programme” at New Delhi

In this seminar, Ministry of New and Renewable Energy (MNRE), Government of India notified the National Bioenergy Programme on November 2, 2022 and launched the Biourja and Biogas portals. MNRE has continued the National Bioenergy Programme for the period from FY 2021-22 to 2025-26. Scientist from SSS-NIBE participated in the event. The Programme has been recommended for implementation in

two Phases. The Phase-I of the Programme has been approved with a budget outlay of Rs. 858 crore.



The National Bioenergy Programme comprises of the following sub-schemes:

- I. Waste to Energy Programme to support setting up of large Biogas, BioCNG and Power plants.
- II. Biomass Programme to support setting up of pellets and briquettes for use in power generation and non-bagasse based power generation projects.
- III. Biogas Programme to support setting up of family and medium size Biogas in rural areas.

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