नवीन और
नवीकरणीय ऊर्जा मंत्रालय
MINISTRY OF
NEW AND
RENEWABLE ENERGY
सत्यमेव जयते

Quarterly Newsletter

Bio-ऊर्जा

April 2023

SSS NIBE

G20 भारत 2023 INDIA

SARDAR SWARAN SINGH NATIONAL INSTITUTE OF BIO-ENERGY

(An autonomous institute of Ministry of New and Renewable Energy, GoI)

Issue 2

Word from Director General, SSS-NIBE

As we step into new financial year 2023-24, the second edition of our quarterly newsletter is due for release. The previous financial year was productive, where new scientists brought fresh ideas and experience, and the inputs from committees consolidated into a rejuvenated Technology Roadmap for the institute. We have set ourselves ambitious goals for this year which includes setting up of pilot plants for 2G ethanol, biogas from lignocellulosic biomass and technology demonstration program for improved biomass cook stoves/combustors. We are also striving to get NABL accreditation this year. The other major task we have embarked is to hold 4thInternational Conference on Recent Advances in Biomass Research (ICRABR) at our campus during 9-12th October 2023, for which the call for abstracts/papers has been announced. We are eagerly looking forward to this event to witness the latest developments in the field of biomass and also broaden our horizon. I would like to once again 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.

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

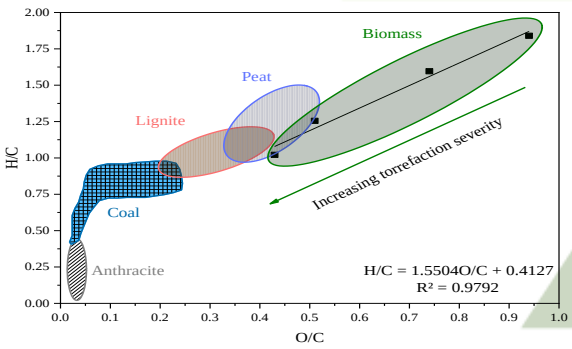
"INNOVATION FOR THE PEOPLE AND BY THE PEOPLE IS DIRECTION OF OUR NEW INDIA"

….Hon'ble PM Narendra Modi Ji

Research and Innovation

Torrefied mustard straw as a potential solid biofuel

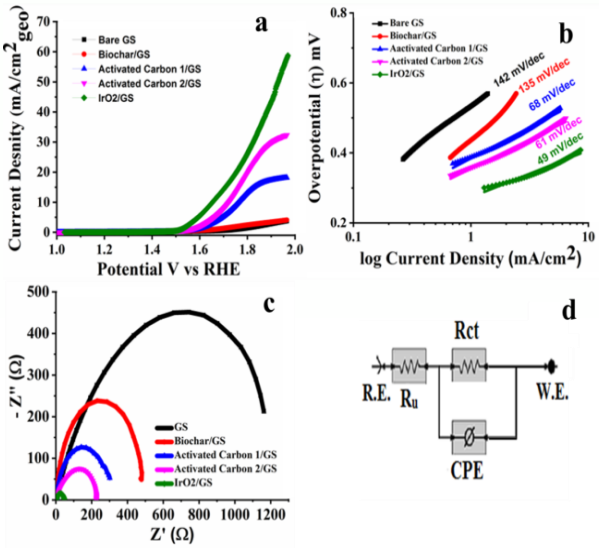
Torrefaction improves the characteristics of biomass, making them more suitable as energy source. Knowledge of emission profiles adds greatly to the design of emission control technology, assisting in the production of ecologically friendly bioenergy. Comprehensive study comparing the physicochemical parameters and emission patterns of raw and torrefied agro residue for bioenergy use is lacking in the literature. Using this approach, the impact of torrefaction on the physicochemical properties of mustard straws as fuel alternatives and emission patterns during burning was examined. Mustard is one of the most extensively used oilseeds, and it generates a large amount of agricultural biomass residue. Every year, 68.19 MMT of mustard is produced globally, with the majority harvested in the European Union, Canada, China, and India. India supplies 11.61% of global output, resulting in the generation of 1.85 tonnes of agricultural waste every metric tonne of mustard seed. In addition to the fact that mustard straws cannot be utilised as fodder for cow feed due to their glucosinolate concentration, a fool-proof and sustainable method of disposing of the residue for use as a clean energy source after a few thermo-chemical changes is required. Because mustard straw is abundant in the northern part of India and around the world, raw and torrefied mustard straws were researched for the current study. Torrefaction studies were conducted on mustard straw for 60 minutes at temperatures ranging from 200°C to 300°C. The biomass was characterized using proximate analysis, ultimate analysis, and high heating values (HHV). The emissions of NOx, SO_2, CO_2, CO_2, and dust from the combustion of raw/torrefied mustard straws were then measured.



Van Krevelen diagram of raw and torrefied mustard straw with different types of coal

During torrefaction, the carbon content of biomass increased from 40% to 55%, but the hydrogen (6% to 5%) and oxygen content (42% to 29%) decreased. The energy yield of a torrefied mustard straw was 76.24%, 88.98%, and 94.75% at 200 °C, 250 °C, and 300 °C, respectively. Torrefaction increases the bulk density of mustard straw while decreasing mass yield and improving ignitability. The outcomes of this study should provide practical

insight into how raw mustard straw might be enhanced to produce densified solid biofuels suitable for industrial and thermal power plant applications. The findings will help to improve comparisons of torrefied mustard straws and other torrefied agricultural wastes.



Some glimpse of research work

Biomass Derived Metal Free Hierarchical Porous Activated Carbon for Efficient Oxygen Evolution Reaction

The solution to the energy issue associated with green H_2 production is dependent on the development of new, effective, long-term and affordable electrocatalysts for oxygen evolution reaction by electrochemical water-splitting. The oxygen evolution process has lately gained popularity due to its capacity to provide clean energy. The development of high electro-efficiency and long-term metal-free catalysts to replace noble materials is critical for the advancement of potential renewable energy conversion and storage systems. SSS-NIBE researchers developed an efficient "waste to clean energy" concept-based porous activated carbon from waste rice husk with hierarchical pore architecture for the oxygen evolution process. Researchers develop a new family of pyrolyzed carbons with 2D morphology and hierarchical pore structure for effective oxygen evolution in alkaline solution utilising KOH and rice husk as carbon precursors. Various analytical techniques were used to investigate the physicochemical features of the synthesised activated carbon material. Characterization of the activated carbon synthesised from rice husk reveals a high BET surface area with a large pore volume. In 1M KOH solution, the electro-catalytic performance of the produced porous activated carbon was investigated using linear sweep voltammetry (LSV), Tafel slope, Electrochemical Impedance Spectroscopy (EIS), and cyclic voltammetry (CV). It exhibits low-onset potential, a small Tafel slope, an over potential of 0.47 V, low Rct, and good stability towards OER performance even after 500 cycles as an electrocatalytic performance in alkaline media. The performance of 2D carbon catalysts made from rice husk have demonstrated an impact on electrochemically active surface area and mass activity. The research results will aid in the development of a material that can effectively replace noble metals.

News and Events

Hindi Advisory Committee Meeting

The Director General represented the institute's Hindi activities at the second meeting of the MNRE's Hindi Advisory Committee, which was held on 4th January, 2023 at New Delhi under the chairmanship of Hon'ble Cabinet Minister of New and Renewable Energy.

Also a meeting of Hindi Salahkar Samiti-MNRE was organized in online mode on 27th March, 2023 under the chairmanship of Director General SSS-NIBE to review the work done in Hindi at the institute in quarter (January-March 2023).

Felicitation of Dr. Anuj Kumar Chandel by DG, NIBE.

Guest lecture

On 10th January, 2023, a guest talk by Dr. Anuj Kumar Chandel was scheduled at the institute. Dr. Anuj Kumar Chandel, is a distinguished scientist from the University of So Paulo in Lorena, Brazil. He delivered a talk on "Key insights from a commercial scale 2G ethanol production plant: Challenges and Perspectives". At SSS-NIBE, researchers took an active role in learning from more seasoned scientists.

Lohri Celebration

Lohri is a well-known event celebrated in North India, primarily in Punjab; SSS-NIBE enthusiastically celebrated the festival on 13th January, 2023. Furthermore the Lohri holiday was actively celebrated by each member of the SSS-NIBE family.

Republic Day celebration

The institute actively celebrated the 74th Republic Day on 26th January, 2023. The Institute's Director General unfurled the flag on this occasion. Following the unfurling of the flag, DG NIBE planted trees in the institute campus. Researchers, NIBE personnel, and their families also organized a cultural event.

DG, NIBE unfurling the National Flag

Guest Lecture

On 21Ist February, 2023, Dr. Ajay K. Dalai, distinguished Professor of Chemical Engineering and Canada Chair in Bio Energy and Environmentally Friendly Chemical

Processing at Saskatchewan University, Canada, who is also member of the SSS-NIBE Research Advisory Committee visited SSS-NIBE. He gave a lecture on clean and sustainable energy production for pollution abatement using bioprocessing technology and interacted with all the scientists and research fellows.

Guest Lecture by Dr. Ajay K Dalai

3rdMarch, 2023 in the auditorium. All female researchers and staff members were honored on this occasion, and Dr. Neelima Jerath, Director General of Pushpa Gujral Science City, Kapurthala, was invited as a Chief Guest.

Women's Day Celebration

Women's Day celebration

Every year on 8th March, we celebrate International Women's Day. This year on the account of Holi Festival the institute celebrated International Women's Day on

International Conference

Online call for abstract/paper submission has been announced for the 4th International Conference on Recent Advances in Bioenergy Research – ICRABR, to be held at SSS-NIBE, Kapurthala between 9 and 12th October 2023. Full length manuscripts are invited related to the conference themes mentioned below.

Broad themes/Tracks:

- Biomass Resource Management
- Biomass/waste conversion to energy
- Biomass Valorisation/ Waste to value added materials/ Products
- Modelling of Bio-energy system
- Biorefinery and Biohydrogen

All submitted manuscripts will undergo a peer review process for selection. Selected papers from the conference will be published in Scopus Indexed Proceedings and Journals after peer review. The details of the publication will be updated on the conference website. Eminent speakers will deliver lecture. More details are available on: https://www.icrabr.com/

Important Dates

Abstract or Extended Abstract submission	:	01 July , 2023
Submission deadline for Abstract	:	30 July, 2023
Deadline to avail early bird discount	:	01 August, 2023
Final registration date for authors	:	15 September, 2023

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Director General,
Sardar Swaran Singh National
Institute of Bio-Energy, Kapurthala,
Punjab, 144603

Website: http://nibe.res.in
Email: sss.nibe@nibe.res.in
Telephone: (+91)1822507406
Twitter@SssNibe
Facebook: https//www.facebook.com/SSS.NIBE

******For suggestion please contact at sss.nibe@nibe.res.in******