A Mini Project Report
On
Creatine Monohydrate Making Process

Submitted in partial fulfilment of the requirement of credits in
Third year of

Bachelor of Technology
in
Chemical Engineering

Submitted by

SAGAR KUMAR

Session 2024-25

Guided by

Mr. Satyajit Bhattacharjee
Assistant Professor
Department of Chemical Engineering
Guru Ghasidas Vishwavidyalaya Bilaspur, Chhattisgarh

CERTIFICATE OF APPROVAL

This is to certify that the project entitled "**Creatine Monohydrate Making Process**" submitted by **Sagar Kumar** in partial fulfilment of the requirement of credits in Third year of **Bachelor's of Technology, Chemical Engineering** is a record of Bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associate-ship, fellowship, or other similar titles to them. We, further certify that the work reported in this project was carried out independently by the candidate.

Approved by

Dr.Raghwendra Singh Thakur
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Guided by

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Mini Project
A Review Report
on
Preparation of Bioplastics from Biomass: A Sustainable Solution

Submitted in partial fulfilment of the requirement of credits in Third year of

Bachelor of Technology

in

Chemical Engineering

Submitted by

Sagar Raj

Roll no:-22021148

Group no:-12

Date:-17/12/24

Session 2024-25

Guided by

Dr. Satyajit Bhattacharjee

Assistant Professor

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CERTIFICATE OF APPROVAL

This is to certify that the project entitled **"Preparation of Bioplastics from Biomass: A Sustainable Solution"** submitted by Sagar Raj in partial fulfilment of the requirement of credits in Third year of **Bachelor's of Technology, Chemical Engineering** is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associate-ship, fellowship, or other similar titles to them. We, further certify that the work reported in this project was carried out independently by the candidate.

Sagar Raj
Roll no:-22021148

The entitled work is original and no part of this work is submitted to any university for the award of any degree or diploma.

Dr. Raghvendra Singh Thakur
Head Department of Chemical Engineering

Mr. Satyajit Bhattacharjee
Assistant Professor, Che.

Approved by

Dr. Raghvendra Singh Thakur
Head
Department of Chemical Engineering
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Bilaspur, Chhattisgarh

Guided by

02/6/23

Mr. Satyajit Bhattacharjee
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Mini Project Report on

This study used Red flower's Leaves of Banana to prepare carboxy Methyl Cellulose (CMC)

Submitted in partial fulfilment of the requirement of Credits in Third year of

Bachelor of Technology in Chemical Engineering

Submitted by

Group No:-06

Sandeep kumar

B.Tech. v semester

Date:-16/12/24

Session 2024-25

Guided by:-	Co-Guided by:-
Dr. Neeraj Chandrakar	Mr. Satyajit Bhattacharjee
Associate Professor	Assistant Professor

Department of Chemical Engineering

School of Studies of Engineering and Technology

Guru Ghasidas Vishwavidyalaya, Koni, Bilaspur, Chhattisgarh

(A central university established by the central university Act, 2009)

CERTIFICATE OF APPROVAL

This is to certify that the project entitled **"Preparation of Carboxy Methyl Cellulose(CMC) from Red Flower's leaves of Banana"** submitted by Sandeep Kumar Roll No(22021151 in fulfilment of the requirements of Credits in Third year of **Bachelor of Technology, Chemical Engineering** is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associate-ship, fellowship, or other similar titles to them.

We, further certify that the work reported in this project was carried out independently by the candidate.

Sandeep Kumar

Roll No:-22021151

This is to certify that the above statement made by the students is correct in the best of my knowledge.

Date:

Approved by	**Guided by**
Dr. Raghvendra Singh Thakur Head Department of Chemical Engineering School of studies of Engineering and Technology. Guru Ghasidas Vishwavidyalaya Bilaspur, Chhattisgarh.	**Dr. Neeraj Chandrakar** Associate Professor Che. **Co-Guided by** **Mr. Satyajit Bhattacharjee** Assistant Professor Che.

A

Minor Project Report

on

Design of a Benzene Production Plant using DWSIM

Submitted in partial fulfilment of the requirement of Credits in Third year of

Bachelor of Technology in Chemical Engineering

Submitted by

Shivam kumar

Session 2023-24

Guided by:-
Dr. Saurabh Meshram
Associate Proffesor

Department of Chemical Engineering

School of Studies of Engineering and Technology

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CERTIFICATE OF APPROVAL

This is to certify that the project entitled **"Design of a Benzene Production Plant using DWSIM"** submitted by Sandeep Kumar Roll No(22021151in fulfilment of the requirements for the degree of **Bachelor of Technology** in **Chemical Engineering** is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associate-ship, fellowship, or other similar titles to them. We, further certify that the work reported in this project was carried out independently by the candidate.

Approved by	***Guided by***
Dr. Raghwendra Singh Thakur Head Department of Chemical Engineering School of studies of Engineering and Technology Guru Ghasidas Vishwavidyalaya Bilaspur, Chhattisgarh	**Dr. Saurabh Meshram** Associate proffesor Department of Chemical Engineering School of studies of Engineering and Technology Guru Ghasidas Vishwavidyalaya Bilaspur, Chhattisgarh

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ABSTRACT

Benzene is a key industrial chemical widely utilized as a feedstock in the production of numerous essential derivatives, including styrene, phenol, and aniline. This project focuses on the design of a chemical plant for the production of benzene using the **hydrodealkylation (HDA) process** with DWSIM software for simulation and design optimization. The HDA process involves the reaction of toluene with hydrogen to produce benzene and methane as a byproduct. This method is chosen due to its efficiency, high product purity, and readily available feedstock.

The scope of this project includes detailed process simulation, mass and energy balance calculations, and the design of major equipment such as the reactor, heat exchangers, and distillation column. The reactor operates under high-temperature (500–600°C) and high-pressure (30–50 bar) conditions to achieve the desired conversion rate. Distillation is employed to separate benzene from unreacted toluene and methane, ensuring a high-purity product stream.

Environmental and safety considerations have been carefully addressed, including the management of methane emissions, proper catalyst handling, and adherence to explosion-proof design standards. An economic feasibility analysis is also included to evaluate the cost-effectiveness of the plant design.

By leveraging DWSIM software, this project delivers a robust and optimized design for benzene production that aligns with industrial standards for efficiency, safety, and sustainability.

- High purity benzene product.
- Readily available feedstock (toluene).
- Moderate operating conditions.

A
Minor Project Report
on

Evaluating the Efficiency of Artificial Neural Networks in Predicting Fluidization Characteristics in Gas-Solid Beds with Varied Particle Size Distributions

Submitted in partial fulfilment of the requirement of credits in fifth semester of

Bachelor of Technology
in
Chemical Engineering

Submitted by

Shreyansh Shukla

Session 2024-25

Guided by

Mr. Vishnu Prasad Yadav
Assistant Professor
Department of Chemical Engineering,
School of Studies of Engineering & Technology
Guru Ghasidas Vishwavidyalaya Bilaspur, Chhattisgarh

Department of Chemical Engineering
School of Studies of Engineering and Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh

CERTIFICATE OF APPROVAL

This is to certify that the project entitled **"Evaluating the Efficiency of Artificial Neural Networks in Predicting Fluidization Characteristics in Gas-Solid Beds with Varied Particle Size Distributions"** submitted by Shreyansh Shukla (Roll No. : 22021155) **in partial fulfilment of the requirement of credits in third year of Bachelor's of Technology, Chemical Engineering** is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associate-ship, fellowship, or other similar titles to them. We, further certify that the work reported in this project was carried out independently by the candidate.

Dr. Raghwendra Singh Thakur
Head of Department
Department of Chemical Engineering
SoS Engineering and Technology
Guru Ghasidas Vishwavidyalaya Bilaspur
Chhattisgarh

Mr. Vishnu Prasad Yadav
Assistant Professor
Department of Chemical Engineering
SoS Engineering and Technology
Guru Ghasidas Vishwavidyalaya
Bilaspur Chhattisgarh

ABSTRACT

In reviewing the study on the minimum fluidization velocity (Umf) and maximum pressure drop (ΔPmax) of a gas-solid fluidized bed, it's clear that these hydrodynamic characteristics are essential for optimizing the design and operational conditions of such systems. The research introduces a multi-layer perceptron (MLP) model based on an artificial neural network (ANN) to predict these characteristics accurately, considering the influence of particle size distribution (PSD).

The MLP model's parameters were fine-tuned using the backpropagation learning algorithm, leveraging extensive experimental data and literature. Five key dimensionless groups of parameters were employed to estimate Umf and ΔPmax simultaneously. The statistical accuracy analysis revealed that a two-layer feedforward network with thirteen hidden neurons provided the best architecture for the MLP model. The model's performance was evaluated using absolute average relative deviation (AARD), mean square error (MSE), and regression coefficient (R^2), achieving accuracies of 10.36% and 8.35% for Umf and ΔPmax, respectively, with AARD, 1.7×10^{-4} and 0.0188 for MSE, and 0.9935 and 0.9152 for R^2.

Furthermore, the study compared the predictive performance of the developed MLP model with other existing literature models, demonstrating that the MLP model's performance was acceptable and, in many cases, superior. This review highlights the effectiveness of the MLP model in providing reliable predictions for the hydrodynamic characteristics of gas-solid fluidized beds, making it a valuable tool for optimizing fluidized bed design and operation.

In the study, the input variables influencing the hydrodynamics behavior of this system were solid particle diameter (dp), solid particle density (ρs), gas density (ρg), gas viscosity (μg), internal column diameter (Do) and the initial height of solid particle in the bed (H 0).These parameters were recase into dimensionless groups, which were Archimedes number ($Ar = gd_p^3\rho_g(\rho_s - \rho_g)/\mu_g^2$), H_o/D_o and D_p/D_o.

As observed from Fig 1., the Umf and ΔPmax are estimated as a function of Ar, H0/D0, dp/D0, SD, and Skewness.

A

Project Report

On

COMPARATIVE ANALYSIS OF DETERGENT CLEANING POWDER

BACHELOR OF TECHNOLOGY

in

CHEMICAL ENGINEERING

UNDER THE GUIDANCE OF

Dr. Neeraj Chandrakar
And
Mr. Satyajit Bhattacharjee

SUBMITTED BY

Sujit Kumar (22021158)

DEPARTMENT OF CHEMICAL ENGINEERING SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY GURU GHASIDAS VISHWAVIDYALAYA, CHHATTISGARH, BILASPUR-495009, INDIA

DEPARTMENT OF CHEMICAL ENGINEERING
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GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR, INDIA

CERTIFICATE

This is to certify that the project entitled "**COMPARATIVE ANALYSIS OF DETERGENT CLEANING POWDER**" a review report submitted by sujit Kumar (22021158) in fulfillment of requirement for the degree of Bachelor of technology in Chemical engineering is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree ,diploma, associateship , fellowship ,or other similar title of them .We ,further clarify that the work report in this project was carried out independently by the candidates.

Guided by	**Co-Guided By**	**Approved By**
Signature_____	Signature_____	Signature_____
Dr. Neeraj Chandrakar	**Mr. Satyajit Bhattacharjee**	**Dr.Raghwendra Singh Thakur**
Associate professor	**Assistant professor**	**Head of Department**

MINI PROJECT REPORT

ON

"RECYCLING OF AGRICULTURE WASTE BIOMAS AND CIRCULAR BIO ECONOMY"

Submitted in the partial fulfillment for the award of

the Degree of **Bachelor of Technology**

CHEMICAL ENGINEERING

By

TEJAVATH VEERANNA(22021161)

B. Tech, V Semester

Under the guidance of

Mr. VISHNU PRASAD YADAV

ASSISTANT PROFESSOR

DEPARTMENT OF CHEMICAL ENGINEERING

SCHOOL OF STUDIES OF ENGINEERING AND TECHNOLOGY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

SESSION: 2024-25

DEPARTMENT OF CHEMICAL ENGINEERING
SCHOOL OF STUDIES IN ENGINEERING AND TECHNOLOGY GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

(A Central University established by the Central University Act 2009 No. 25 of 2009)

CERTIFICATE

It is certified that the mini project entitled **"RECYCLING OF AGRICUTURE WASTE BIOMAS AND CIRCULAR BIO ECONOMY"** submitted by Tejavath Veeranna in partial fulfillment of the requirements of the award of the degree of Bachelor of Technology in Chemical Engineering, School of studies in Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur, is carried out by them in the Department of Chemical Engineering during session 2023-24 under supervision and guidance of **Mr. VISHNU PRASAD YADAV** , Assistant Professor, Department of Chemical Engineering, School of Studies in Engineering & Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur CG.

DR.RAGHWENDRA SINGH THAKUR
Head of Department
Department of Chemical Engineering
School of Studies in Engineering & Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur CG

ABSTRACT

The over dependency on conventional fossil energy resources is the consequence of high energy demand and excessive consumption of petroleum fuel, which turns out to be a major concern of 21st century. As far as sustainability is concerned, fuels derived from organic or plant wastes overcome this downside and also are an established solution of the traditional oil resources depletion. Use of agricultural waste rather lignocellulosic biomass as a feedstock for biorefinery approach emerges to be an eco-friendly process for the production of biofuel and value-added chemicals intensifying the energy security. The view of bioeconomy highlights the fruitful use of agricultural waste biomass in biorefinery acquiring such a system so that the by-products can be further utilized with low or no waste generation to maintain the sustainability and circularity of economy which are critically described.

A

Project Report On

BANANA PEELS AS A GREEN BIOADSORBENT FOR REMOVING METAL IONS FROM WASTE WATER

BACHELOR OF TECHNOLOGY

in

CHEMICAL ENGINEERING

SUBMITTED BY

Rangaritejus(22021143)

UNDER THE GUIDANCE OF

Dr Saurabh Meshram

DEPARTMENT OF CHEMICAL ENGINEERING SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, CHHATTISGARH,

BILASPUR-495009, INDIA

CERTIFICATE OF APPROVAL

This is to certify that the project entitled " **BANANA PEELS AS A GREEN BIOADSORBENT FOR REMOVING METAL IONS FROM WASTE WATER** " submitted by **RANGARI TEJUS** (Roll No. : 22021143) in fulfilment of the requirements for the degree of **Bachelor of Technology** in **Chemical Engineering** is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associateship, fellowship, or other similar titles to them. We, further certify that the work reported in this project was carried out independently by the candidate.

Approved by

Dr. Raghwendra Singh Thakur
Head
Department of Chemical Engineering
School of studies of Engineering and Technology
and Technology
Guru Ghasidas Vishwavidyalaya Bilaspur, Chhattisgarh

Guided by

Dr. Saurabh Meshram
Associate professor
Department of chemical engineering
School of studies of Engineering
Guru Ghasidas Vishwavidyalaya
Bilaspur Chhattisgarh

Abstract

The use of agricultural waste for bio adsorption is a very interesting way of removing toxic metals from wastewater. The functional group of activated BPs (scilicet alcohols, phenols, and amino acids) may be the possible metal ion bonds. Scanning electron microscopy (SEM) along with energy-dispersive X-ray spectroscopy (EDS) was also used to study the nature of cavities on the BPs surface and establish that the cavities were filled with oxygen and potassium. Various conditions, viz. pH, contact time, sorbent dosage, metal concentration, and temperature, were the factors influencing the adsorption capacity of BPs. The model of Langmuir, Freundlich, Tempkin, and Dubinios - Radushkekvichwas used to explain the dynamic binding of Cu(II) and Zn(II). It was found out that the Langmuir isotherm model was the best model to describe the adsorption process. This model implied that metal going from the liquid to the BPs is a monolayer. In the adsorption of Cu(II) and Zn(II), the highest absorption rates were 3.2 mg g−1 and 2.8 mg g−1, respectively, which proved that BPs are effective. Kinetic studies pointed to pseudo-first-order (PFO) for Cu(II) and pseudo-second-order (PSO) for Zn(II) adsorption. The experiments revealed that the adsorption of copper(II) and the adsorption of zinc(II) were spontaneous and exothermic at the same time. After that the BPs sorbent was successfully applied to remove the different metal ions that did not belong to from real wastewater samples collected from the El Wadi drain.

A

MINI PROJECT

ON

"ONION NATURAL DYING ON FABRIC"

Bachelor of Technology

in

chemical engineering

Submitted

by

Vikash Kumar(22021162)
Ujjawal Maraavi(22021159)

(BACHELOR OF CHEMICAL ENGINEERIMG)

5TH SEM

Under the guidance of

Dr.A.N. Joshi
Associate professor

Department of chemical engineering

Department of Chemical Engg.

School of studies Engineering & Technology(Zip code-495009,CG)

DEPARTMENT OF CHEMICAL ENGINEERING
School Of Studies Engineering & Technology
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
A Central University Established By The Central University Act 2009 No. 25 of 2009

CRTIFICATE OF APPROVAL

It is certified that the mini project entitled **"natural die on fabric"** submitted by **Vikash Kumar** *and* **Ujjawal Maravi** in partial fulfillment of the requirements of the award of the degree of Bachelor of Technology in Chemical Engineering, School of studies Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur, is carried out by them in the Department of Chemical Engineering during session 2024-25 under supervision and guidance of **Dr. A. N. Joshi**, Department of Chemical Engineering, School of Studies Engineering & Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G).

Guided By

Signature_____

Dr. A. N. Joshi

(Associate Professor)
Department Of Chemical Engineering
School of Studies of Engineering and
Technology Guru Ghasidas Viswavidyalaya
Bilaspur, Chhattisgarh

Approved By

Signature_____

Dr. Raghwendra Singh Thakur

Head Of Department
Chemical Engineering
School of Studies of Engineering and
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Bilaspur, Chhattisgarh

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A
MINI PROJECT
ON
KHANDSARI SUGAR

SUBMITTED IN
DEGREE OF BACHELOR OF
TECHNOLOGY IN CHEMICAL ENGINEERING

SUBMITTED BY
VIKASH RAJ

GUIDED BY

DR. SAURABH MESHRAM
ASSISTANT PROFESSOR
DEPARTMENT OF CHEMICAL ENGINEERING
Assistant Professor

Department of Chemical Engineering
School of Studies of Engineering and Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)- 495009

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CERTIFICATE OF APPROVAL

This is to certify that the project entitled "KHANDSARI SUGAR" a review report submitted by **VIKASH RAJ (22021163)** in fulfilment of requirement for the degree of Bachelor of technology in Chemical engineering is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree ,diploma, associate-ship , fellowship ,or other similar title of them .We ,further clarify that the work report in this project was carried out independently by the candidates.

Approved by
Dr. Raghwendra Singh Thakur
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University Bilaspur , Chhattisgarh

Guided by
Dr. SAURABH MESHRAM
Assistant Professor
Department of Chemical Engineering
School of Studies Engineering
and Technology Guru Ghasidas
University Bilaspur , Chhattisgarh

A
Mini Project Report
on

Advancing Sustainable Energy Solutions: The role of green hydrogen in modern world: A literature review.

Submitted in partial fulfilment of the requirement of credits in third year of

Bachelor of Technology
in
Chemical Engineering

Submitted by

Vishal Pratap (22021165)
Alok Sangam (22021166)
Astha Agarwal (22021114)

Session 2024-25

Under the guidance of:

Dr. Raghwendra Singh Thakur
Associate Professor

Department of Chemical Engineering
School of Studies of Engineering and Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh

July-December 2024

Department of Chemical Engineering

School of Studies of Engineering and Technology

Guru Ghasidas Vishwavidyalaya, Bilaspur

Certificate

This is to certify that the project entitled, **"Advancing Sustainable Energy Solutions: The role of green hydrogen in modern world: A literature Review** by Vishal Pratap (22021165), Alok Sangam (22021166), Astha Agarwal (22021114) in partial fulfilments for the requirements for the award of Bachelor of Technology Degree in Chemical Engineering is a Bonafide record of the work carried out by them under my supervision and guidance. This is to certify that the above statement made by the student is correct to the best of my knowledge.

Signature of

Dr. Raghwendra Singh Thakur

(Associate professor)

16 December 2024

ABSTRACT

Green hydrogen, often regarded as the "fuel of the future," is emerging as a key component in the global transition toward sustainable energy systems. Produced through renewable-energy-driven processes like water electrolysis, powered by solar, wind, and hydropower, it offers a clean alternative to conventional hydrogen derived from fossil fuels. Unlike gray hydrogen, which emits greenhouse gases, or blue hydrogen, which relies on carbon capture technologies, green hydrogen generates minimal emissions, making it an effective solution to combat climate change and support energy resilience.

Electrolysis, the primary method of green hydrogen production, uses electricity to split water into hydrogen and oxygen, creating a carbon-neutral fuel. Advances in photoelectrochemical water splitting have further broadened possibilities by harnessing solar energy to drive this process. Additionally, biological methods employ microorganisms to sustainably produce hydrogen, offering renewable options for clean energy.

Despite its advantages, storage and transportation remain challenges. Hydrogen can be compressed into high-pressure tanks or liquefied at extremely low temperatures to increase energy density. Carrier molecules like ammonia and Liquid Organic Hydrogen Carriers (LOHCs) allow efficient transport in liquid form under ambient conditions. Solid-state storage through metal hydrides also provides compact and safe alternatives, particularly for portable applications.

Green hydrogen demonstrates immense versatility across sectors. In transportation, hydrogen fuel cells power vehicles, trains, and ships, enabling zero-emission mobility. It also plays a significant role in decarbonizing industries like steel manufacturing and chemical production, where direct electrification is less feasible. Furthermore, hydrogen offers grid stability by storing surplus renewable energy, addressing variability in supply.

Although the cost of producing green hydrogen remains high, technological advancements and improvements in electrolyzer efficiency are driving prices down, making large-scale adoption more viable. Its environmental benefits, including near-zero emissions, further underscore its potential as a sustainable energy source.

While green hydrogen faces challenges related to cost, infrastructure, and scalability, ongoing research and development efforts are paving the way for its broader implementation. With its ability to decarbonize industries, balance renewable energy systems, and provide clean fuel, green hydrogen is set to play a defining role in building a sustainable, low-carbon future.

Mini Project
A Review Report
on
Production of Bio-lubricant from waste cooking oils

Submitted in partial fulfilment of the requirement of credits in Third year of

Bachelor of Technology
in
Chemical Engineering

Submitted by

SAKSHI KUMARI
SAKSHI PRIYA
NIDHI NETAM
PANKAJ PATEL
MUKESH SAHU
GANESH NAYAK

Session 2024-25

Guided by

Dr. Pankaj Kumar
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Guru Ghasidas Vishwavidyalaya Bilaspur, Chhattisgarh

Department of Chemical Engineering
School of Studies of Engineering and Technology
Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh

CERTIFICATE OF APPROVAL

This is to certify that the project entitled "**Production of Bio-lubricant from waste cooking oils**" submitted by **Sakshi kumari , Sakshi Priya , Nidhi Netam , Pankaj Patel , Mukesh Sahu , Ganesh Kumar** in partial fulfilment of the requirement of credits in Third year of **Bachelor's of Technology, Chemical Engineering** is a record of bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree, diploma, associate-ship, fellowship, or other similar titles to them. We, further certify that the work reported in this project was carried out independently by the candidate.

Signature Of Students

SAKSHI KULMARI	SAKSHI PRIYA	NIDHI NETAM
MUKESH SAHU	GANESH KUMAR	PANKAJ PATEL

This is to certify that the above statement made by the students is correct in the best of my knowledge.

Date:

Dr. Raghvendra Singh Thakur
Head Department of Chemical Engineering

Dr. Pankaj Kumar
Assistant Professor, Che.

Approved by

Dr. Raghvendra Singh Thakur
Head
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Bilaspur, Chhattisgarh

Guided by

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A

Mini Project Report

On

Soap Making Process

Submitted in partial fulfillment of the requirement of the degree of

Bachelor Of Technology

In

Chemical Engineering

Submitted by

Name	Roll No.
Tanu Singh	22021169

Guided By

Prof. Saurabh Meshram

Department of Chemical Engineering

School of Studies Engineering & Technology

Guru Ghasidas Viswavidyalaya (A central University)

Bilaspur (C.G.)

DEPARTMENT OF CHEMICAL ENGINEERING

School Of Studies Engineering & Technology

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

(A Central University Established By The Central University Act 2009 No. 25 of 2009)

DEPARTMENT OF CHEMICAL ENGINEERING
School Of Studies Engineering & Technology
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A Central University Established By The Central University Act 2009
No. 25 of 2009)

CERTIFICATE OF APPROVAL

It is certified that the mini project entitled **"Soap Making Process"** submitted by **Tanu Singh** in partial fulfillment of the requirements of the award of the degree of Bachelor of Technology in Chemical Engineering, School of studies Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur, is carried out by them in the Department of Chemical Engineering during session 2024-25 under supervision and guidance of **Prof. Saurabh Meshram**, Department of Chemical Engineering,School of Studies Engineering & Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G).

Guided By

Signature

Prof. Saurabh Meshram
Department Of Chemical Engineering
School of Studies of Engineering and
Technology Guru Ghasidas Viswavidyalaya
Bilaspur, Chhattisgarh

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A

MINI PROJECT REPORT

ON

LITHIUM-ION BATTERY RECYCLING

Submitted in partial fulfilment of the requirement of the degree

Bachelor of Technology

In

Chemical Engineering

SUBMITTED BY

ANKUR KUMAR

BUNTY KUMAR RAJAK

GUIDED BY

Dr. SANDEEP DHARMADHIKARI

ASSISTANT PROFESSOR

DEPARTMENT OF CHEMICAL ENGINEERING

Department of Chemical Engineering

School of Studies of Engineering and Technology

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)- 495009

CERTIFICATE OF APPROVAL

This is to certify that the project entitled "**Lithium Ion Battery Recycle**" a review report submitted by **Ankur Kumar(22021111)** and **Bunty Kumar Rajak(22021117)** in fulfilment of requirement for the degree of **Bachelor of technology in Chemical engineering** is a record of Bonafide and original research work carried out by them under our guidance and this project does not include any work which has previously been submitted for the award of other degree ,diploma, associate-ship , fellowship ,or other similar title of them .We ,further clarify that the work report in this project was carried out independently by the candidates.

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Abstract

Lithium-ion batteries have been the basic pillars of modern technology- from smartphones to electric vehicles and many more. The production and use of LIBs has suddenly increased, causing a very significant environmental and resource management challenge. Recycling of lithium-ion batteries offers sustainable solutions by recovering valuable resources like lithium, cobalt, nickel, and manganese as well as reducing the need for virgin resource extraction and reducing environmental impacts.

This paper discusses the present status of LIB recycling technologies: pyrometallurgical, hydrometallurgical, and direct recycling methods. The paper assesses each method's efficiency, environmental impact, and scalability. It also covers the economic viability of recycling processes in relation to circular economy principles. Moreover, the paper addresses regulatory frameworks and the challenges related to collection, sorting, and standardization of batteries.

Improvements in recycling technologies will promote a better rate of material recovery and waste reduction. Better designs in batteries, which are made from recyclable and less toxic materials, can be used to strengthen the recycling ecosystem. Global collaboration between policymakers, industry stakeholders, and researchers should help in setting up efficient recycling infrastructure and promoting sustainable practices in the lithium-ion battery lifecycle.

A

Mini Project Report

On

" Biodiesel Production : A Review "

By

KUDA.DHIKSHITH KUMAR

Enrollment Number : GGV/21/01556

Roll Number : 21021156

DEPARTMENT OF CHEMICAL ENGINEERING

School Of Studies of Engineering & Technology

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

(A Central University Established By The Central University Act 2009)

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CERTIFICATE OF APPROVAL

It is certified that the mini project entitled **"BIODIESEL PRODUCTION A REVIEW"** submitted by **KUDA.DHIKSHITH KUMAR** in partial fulfillment of the requirements of the award of the degree of Bachelor of Technology in Chemical Engineering, School of studies Engineering and Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur, is carried out by them in the Department of Chemical Engineering during session 2024-25 under supervision and guidance of **Mr. Satyajit Bhattacharjee**, Associate professor, Department of Chemical Engineering, School of Studies Engineering & Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G).

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LIST OF FIGURES