

# The Complete Book on Biomass Based Products (Biochemicals, Biofuels, Activated Carbon)

**Author:** NPCS Board of Consultants & Engineers

**Format:** Hardcover

**ISBN:** 9788178331584

**Code:** NI289

**Pages:** 417

**Price:** Rs. 1,575.00 US\$ 42.56

**Publisher:** Asia Pacific Business Press Inc.

Usually ships within **5** days

Biomass use is growing globally. Biomass is biological material derived from living, or recently living organisms. It most often refers to plants or plant-based materials which are specifically called lignocellulosic biomass. Biomass (organic matter that can be converted into energy) may include food crops, crops for energy, crop residues, wood waste and byproducts, and animal manure. It is one of the most plentiful and well-utilized sources of renewable energy in the world. Broadly speaking, it is organic material produced by the photosynthesis of light. The chemical materials (organic compounds of carbons) are stored and can then be used to generate energy. The most common biomass used for energy is wood from trees. Wood has been used by humans for producing energy for heating and cooking for a very long time.

As an energy source, biomass can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of biofuel. Conversion of biomass to biofuel can be achieved by different methods which are broadly classified into: thermal, chemical, and biochemical methods. Biomass gasification is the conversion of solid fuels like wood and agricultural residues into a combustible gas mixture. The gasification system basically consists of a gasifier unit, a purification system and energy converters- burner or engine.

This book offers comprehensive coverage of the design and analysis of biomass gasification, the key technology enabling the production of biofuels from all viable sources like sugar beet and sweet sorghum. It aims at creating an understanding of the nature of biomass resources for energy and fuels, the variety of processes that are available for conversion of the wastes into energy or fuels. The book discusses the overview of the Biomass Energy along with their Properties, Composition, Benefits, Characteristics and Manufacturing Process of Biomass based products. Also it contains suppliers contact details of plant & machinery with their photographs.

The content includes biomass renewable energy, prospective renewable resources for bio-based processes, biochemical from biomass, biomass based chemicals, biofuel production from biomass crops, biomass gasification, reuse of bio-genic iron oxides and woody biomass fly ash in cement based materials and agricultural areas, biofuel briquettes from biomass, biomass based activated carbon, environmental aspects.

It will be a standard reference book for Professionals, Decision-makers, Engineers, those studying and researching in this important area and others interested in the field of biomass based products. Professionals in academia and industry will appreciate this comprehensive and practical reference book, due to its multidisciplinary nature.

# Contents

## 1. BIOMASS RENEWABLE ENERGY

Introduction

Types of Biomass

Lignocellulosic Biomass

Crops and Vegetables

Waste Biomass

Properties of Biomass

Physical Properties

Densities

True Density

Apparent Density

Bulk Density

Thermodynamic Properties

(a) Thermal Conductivity

(b) Specific Heat

(c) Heat of Formation

(d) Heat of Combustion (Reaction)

(e) Heating Value

(f) Ignition Temperature

Important Constituents of Lignocellulosic Feedstocks

Benefits of Biomass

Disadvantages of Biomass

Biomass Pyramids

Compaction Characteristics of Biomass and Their Significance

Effect of Particle Size

Effect of Moisture

Effect of Temperature of Biomass

Effect of Temperature of the Die

Effect of External Additives

Unit Operations

Anaerobic Digestion

Biomass Energy in India

## 2. PROSPECTIVE RENEWABLE RESOURCE FOR BIO-BASED PROCESSES

Waste Biomass

Types of Waste Biomass

Lignocellulose

Lignocellulose Composition

Cellulose

Hemicellulose

Lignin

Residual Biomasses and the Biorefinery Associated Concept

Bio-Based Processes

Value Addition of Waste Biomass

Biotransformation of Biomass

Transformation of Marine Process Wastes

Biotransformation of Biotechnological Process Wastes

Biochemical Extraction from Biomass

## 3. BIOCHEMICAL FROM BIOMASS

Biomass Conversion

Thermo Chemical Conversion

- (a) Combustion
- Gasification
- Pyrolysis
- Biochemical Conversion
- Fermentation
- Anaerobic Digestion
- Mechanical Extraction
- Biochemical from Biomass
- Biomethanation
- Feature of Biomethanation
- Mechanism of Biomethanation
- Current Status
- Ethanol Fermentation
- Ethanol Fermentation of Saccharine Materials
- Ethanol Fermentation of Starch
- Ethanol Fermentation of Lignocellulosics
- (a) Concentrated Sulfuric Acid Process
- (b) Dilute Sulfuric Acid Process
- Acetone-Butanol Fermentation
- Characteristics of Acetone-Butanol Fermentation
- Reactions of Acetone-Butanol Fermentation
- Energy Efficiency of Acetone-Butanol Fermentation
- Products of Acetone-Butanol Fermentation
- Hydrogen Fermentation
- Characteristics of Hydrogen Fermentation
- Reactions of Hydrogen Fermentation
- Energy Efficiency of Hydrogen Fermentation
- Products of Hydrogen Fermentation
- Lactic Acid Fermentation
- Lactic Acid Bacteria
- Biomass Resources for Lactic Acid Fermentation
- Utilization of Unused Biomass from Palm Oil Industry
- Lactic Acid Fermentation from Kitchen Garbage
- Purification of Lactic Acid
- Silage
- Silage Making
- Silage Fermentation
- Roll Bale Silage
- Composting
- Basic Principles of Composting
- Basic Elements of Composting
- (a) Preprocessing
- (b) Fermentation
- (c) Product Forming Process
- Current Composting Technology
- 4. BIOMASS BASED CHEMICALS
- Chemicals from Biomass as Feedstock
- Biomass Conversion Chemicals
- Methane
- Methanol
- Production of Methanol from Biomass
- Uses and Applications of Methanol
- Waste Water Treatment

Environmentally Friendly  
Chemical Intermediate and Fuel  
Safety in Automotive Fuels  
Government Policy  
Other Applications  
Ethanol  
Properties of Ethanol  
Ethanol Production Process from Sugarcane  
Cleaning of Sugarcane, Extraction of Sugars and Juice Treatment  
Juice Concentration and Sterilization  
Fermentation  
Distillation and Dehydration  
Acetic Acid  
Ethylene  
Glycerol  
Production of Glycerol  
Applications of Glycerol  
Lactic Acid  
Propylene Glycol  
1,3-Propanediol  
Acetone  
Uses of Acetone  
Production of Acetone  
Butanol  
Butanol Fermentation Process  
Advantages of Biobutanol  
Succinic Acid  
Aspartic Acid  
Levulinic Acid  
Itaconic Acid  
Xylitol  
2,5-furandicarboxylic Acid  
Sorbitol  
Uses of Sorbitol  
**5. BIOFUEL PRODUCTION FROM BIOMASS CROPS**  
Biomass Production  
Introduction  
The Holistic Approach  
Pretreatment of Lignocellulosic Biomass to Biofuel  
Bioethanol from Sugar Beet  
Biological Hydrogen from Sweet Sorghum  
Few Crops and Their Residues  
Arhar  
Bajra  
Banana  
Barley  
Coconut  
Coffee  
Coriander  
Cotton  
Dry Chilly  
Dry Ginger  
Green Gram

Ground Nut  
Jowar  
Maize  
Mango  
Masoor  
Moong  
Moth  
Mustard  
Potato  
Soyabean  
Sugarcane  
Tea

## 6. BIOMASS GASIFICATION

Gasification Reactor Types

Moving Bed (Fixed Bed)

Down-draft Gasifiers

Up-draft Gasifier

Fluidized Bed Gasifier

Bubbling Fluidized Bed

Circulating Fluidized Bed Gasifier

Entrained-Flow Reactor

Gasification Reactions and Steps

Gasifying Medium

Chemical Reactions

1. Reactions with Molecular Oxygen

2. Reactions with Carbon Dioxide

3. Reactions with Steam

4. Reactions with Hydrogen

Fuel-Gas Production and Utilization

Synthesis Gas Production

The Gasification Process

Drying

Pyrolysis

Char Gasification Reactions

Speed of Char Reactions

Boudouard Reaction

Water–Gas Reaction

Shift Reaction

Hydrogasification Reaction

Char Combustion Reactions

Catalytic Gasification

Catalyst Selection Criteria

Advantages and Limitations

Advantages

Limitations

Generation of Thermal Energy from Wood through Biomass Gasification System

Scope of Supply

Equipment Description

Appendix & Annexure

## 7. REUSE OF BIO-GENIC IRON OXIDES AND WOODY BIOMASS FLY ASH IN CEMENT BASED MATERIALS AND AGRICULTURAL AREAS

Introduction

Materials and Methods

Preparation of Hardened Cement Paste Specimens

Monolith Leaching Test

Characterization of WBFA

Leaching Behavior of Blended Cement Pastes

## 8. BIOFUEL BRIQUETTES FROM BIOMASS

Properties of Biomass Briquettes

Uses and Applications of Briquette

Feedstock

Market

Pre-processing of Biomass Residues

Bio-briquette Manufacturing Process

Advantages of Biomass Briquetting

Comparative Characteristics of Bio Briquettes

Briquetting Plant

## 9. BIOMASS BASED ACTIVATED CARBON

Introduction

Biomass Pyrolysis and Char Activation

Biomass Properties

Lab-Scale Pyrolysis

Lab-scale Activation

Activation Results

Pore Size Distribution

Generation of Granular Activated Carbon

Rotary Kiln Reactor for Char Activation

Composition of Biological Activated Carbon Process

Composition and Application

Basic Principles of Biological Activated Carbon Technology

Application Fields and the Typical Process Flow of Biological Activated Carbon Technology

Basic Operational Parameters of BAC Process

O<sub>3</sub>-BAC Process and the Evaluation of Ozonation

Mechanism and Characteristics of O<sub>3</sub>-BAC Process

Effect of Ozonation on Molecule Weight Distribution and the Molecule Structure of Organic Matters

Effect of Ozonation on Molecule Weight Distribution of Organic Matters

Effect of Ozonation on the Structure of Organic Matters

Improvement of Biochemical Properties of Organics by Ozonation

Improvement of Ozonation on Biodegradability of Organic Matters

## 10. ENVIRONMENTAL ASPECTS

Impacts of Woody Biomass Harvest

Soil Resources

Forest Health

Wildlife

Water Quality and Fisheries

Environmental Impacts of Biofuels

Ethanol

Biodiesel

## 11. PLANT & MACHINERY PHOTOGRAPHS

## 12. ADDRESSES OF PLANT AND MACHINERY SUPPLIERS

# About NIIR

**NIIR PROJECT CONSULTANCY SERVICES (NPCS)** is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.

Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study, Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

NPCS also publishes various process technology, technical, reference, self employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the input in their research.

Our Detailed Project report aims at providing all the critical data required by any entrepreneur vying to venture into Project. While expanding a current business or while venturing into new business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line.

---

**NIIR PROJECT CONSULTANCY SERVICES** , 106-E, Kamla Nagar, New Delhi-110007, India. **Email:** [npcs.india@gmail.com](mailto:npcs.india@gmail.com) **Website:** [NIIR.org](http://NIIR.org)

Mon, 05 Dec 2022 19:18:22 +0530