

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

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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.

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
O₃-BAC Process and the Evaluation of Ozonation
Mechanism and Characteristics of O₃-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

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