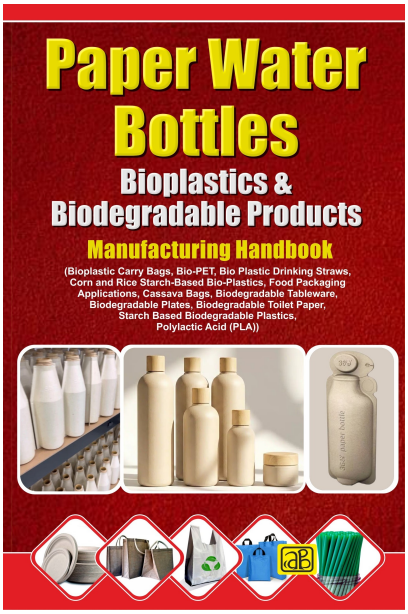
Entrepreneur India

106-E, Kamla Nagar, New Delhi-110007, India.
Tel: 91-11-23843955, +91 9097075054
Mobile: +91-9097075054
Email: npcs.ei@gmail.com, info@entrepreneurindia.co
Website: www.entrepreneurIndia.co



Paper Water Bottles, Bioplastics & Biodegradable Products Manufacturing Handbook

Code	NI377
Format	paperback
Indian Price	₹2475
US Price	$80
Pages	472
ISBN	978-81-940995-4-3

Publisher	Asia Pacific Business Press Inc.

Description

Paper Water Bottles, Bioplastics & Biodegradable Products Manufacturing Handbook

(Bioplastic Carry Bags, Bio-PET, Bio Plastic Drinking Straws, Corn and Rice Starch-Based Bio-Plastics, Food Packaging Applications, Cassava Bags, Biodegradable Tableware, Biodegradable Plates, Biodegradable Toilet Paper, Starch Based Biodegradable Plastics, Polylactic Acid (PLA))

Plastic pollution is one of the biggest environmental problems today. Every year, millions of tonnes of single-use plastic end up in landfills and oceans, harming wildlife, ecosystems, and even human health. The good news is that better alternatives are now available. Bioplastics and biodegradable products can perform the same functions as regular plastics but break down naturally without leaving harmful waste.

The market for these eco-friendly materials is growing quickly around the world, and India is becoming an important player in both production and consumption. Demand is increasing in areas like food packaging, retail, agriculture, healthcare, and consumer goods. Many Indian manufacturers, small businesses, and exporters are now using biodegradable materials, supported by government rules that limit the use of traditional plastics. Globally, there is also a strong demand for certified biodegradable products, making this a fast-growing and profitable industry.

A major focus of the book is on sustainable packaging, especially paper water bottles. These bottles are becoming a popular and eco-friendly alternative to plastic water bottles due to increasing environmental awareness, strict rules against single-use plastics, and growing demand from customers and beverage companies. The book highlights their strong business potential, easy scalability, and wide market acceptance, making them an important product for the future of green manufacturing.

This book provides clear and detailed information about the biodegradable plastics industry, including its growth, challenges, and environmental impact. It covers many products such as carry bags, bottles, straws, food packaging, cassava bags, plates, tableware, and even biodegradable toilet paper. It also explains key materials like PLA, PHAs, and starch-based plastics made from corn, rice, wheat, and potato waste. Along with this, the book includes practical details like manufacturing processes, plant layouts, flow charts, and machinery information, which are very helpful for setting up or improving a production unit.

This handbook is an essential resource for students, researchers, process engineers, startup founders, entrepreneurs, manufacturers, and exporters seeking authoritative, actionable knowledge in the field of sustainable materials and biodegradable product manufacturing. It serves as both a reliable academic

reference and a practical industrial guide for those committed to building responsible, future-ready manufacturing enterprises.

Content

Paper Water Bottles, Bioplastics & Biodegradable Products Manufacturing Handbook

(Bioplastic Carry Bags, Bio-PET, Bio Plastic Drinking Straws, Corn and Rice Starch-Based Bio-Plastics, Food Packaging Applications, Cassava Bags, Biodegradable Tableware, Biodegradable Plates, Biodegradable Toilet Paper, Starch Based Biodegradable Plastics, Polylactic Acid (PLA))

1. INTRODUCTION

1.1. Biodegradable Plastics

1.1.1. Properties

1.1.2. Applications

1.2. Type of Biodegradable Plastics

1.3. Biodegradable Vs. Compostable

1.4. Bio-Based Plastics

1.4.1. Applications

1.4.2. Benefits of Bioplastics

1.5. Renewable Resources

1.5.1. Natural Polymers

1.5.2. Polysaccharides (Carbohydrates)

1.5.3. Proteins

1.5.4. Lignin

1.5.5. Natural Rubber

1.6. Other Biogenic Materials

1.6.1. Plant Oils

1.6.2. Monomers

2. THE BIODEGRADABLE PLASTICS INDUSTRY

2.1. Applications

2.2. Economic and Social Development

2.3. Impact Factors on Bioplastic Demand

2.4. Specific Options for the Development of Bioplastics

2.4.1. Mobilizing Resources for Research and Development

2.4.2. Supporting Scaling Up Activities

2.4.3. Investing in Demonstrator Facilities

2.4.4. Alternative Uses for Feedstock

2.4.5. Agricultural Land Productivity

2.4.6. Alternative Cropping Systems

2.4.7. Public Procurement

2.4.8. Quotas

2.4.9. Subsidies and Taxes

2.4.10. Standards, Labels, and Consumer Awareness

3. BIODEGRADABLE PLASTICS —DEVELOPMENTS AND ENVIRONMENTAL IMPACTS

3.1. Biodegradable

3.1.1. The ASTM Defines 'Biodegradable' as

3.2. Compostable

3.2.1. 'Compostable' is Defined by the ASTM as

3.2.2. Hydro-biodegradable and Photo-biodegradable

3.2.3. Bio-erodable

3.3. Biodegradable Starch-based Polymers

3.3.1. Thermoplastic Starch Products

3.3.2. Starch Synthetic Aliphatic Polyester Blends

3.3.3. Starch and PBS/PBSA Polyester Blends

3.3.4. Starch-PVOH Blends

3.4. Biodegradable Polyesters

3.4.1. PHA (Naturally Produced) Polyesters

3.4.2. PHBH (Naturally Produced) Polyesters

3.4.3. PLA (Renewable Resource) Polyesters

3.4.4. PCL (Synthetic Aliphatic) Polyesters

3.4.5. PBS (Synthetic Aliphatic) Polyesters

3.4.6. AAC Copolyesters

3.4.7. Modified PET

3.5. Other Degradable Polymers

3.6. Water Soluble Polymers

3.6.1. Polyvinyl Alcohol (PVOH)

3.6.2. Ethylene Vinyl Alcohol (EVOH)

3.7. Controlled Degradation Additive Masterbatches

3.8. Emerging Application Areas in Australia

3.9. Coated Paper

3.10. Agricultural Mulch Film

3.11. Shopping Bags

3.12. Food Waste Film and Bags

3.13. Consumer Packaging Materials

3.14. Landfill Cover Film

3.15. Other Applications

3.16. Standards and Test Methods

3.17. Biodegradation Standards and Tests

3.17.1. American Society for Testing and Materials

3.17.2. ASTM D5338-93 (Composting)

3.17.3. ASTM D5209-91 (Aerobic, Sewer Sludge)

3.17.4. ASTM D5210-92 (Anaerobic, Sewage Sludge)

3.17.5. ASTM D5511-94 (High-solids Anaerobic Digestion)

3.17.6. ASTM Tests for Specific Disposal Environments

3.17.7. International Standards Research

3.17.8. International Standards Organisation

3.17.9. European Committee for Normalisation

3.17.10. 'OK Compost' Certification and Logo

3.17.11. Compost Toxicity Tests

3.17.12. Plant Phytotoxicity Testing

3.17.13. Animal Toxicity Test

3.17.14. Difference Between Standards for Biodegradation

3.17.15. Development of Australian Standards

3.17.16. Disposal Environments

3.17.17. Composting Facilities and Soil Burial

3.17.18. Key Factors Defining Compostability

3.17.19. Physical Persistence

3.17.20. Chemical Persistence

3.17.21. Toxicity

3.17.22. Effect on Quality of Compost

3.17.23. Anaerobic Digestion

3.17.24. Waste Water Treatment Plants

3.17.25. Reprocessing Facilities

3.17.26. Landfills

3.17.27. Marine and Freshwater Environments

3.17.28. Litter

3.18. Plastics Sorting and Reprocessing

3.18.1. Key Issues

3.18.2. Recyclable Plastics Sorting Considerations

3.18.3. Reprocessing Considerations

3.18.4. Polyolefin Reprocessing

3.18.5. Polyethylene Reprocessing

3.19. Potential Positive Environment Impacts

3.19.1. Composting

3.19.2. Landfill Degradation

3.19.3. Energy Use

3.19.4. Greenhouse Gas Emissions

3.20. Potential Negative Enviornment Impact

3.20.1. Pollution of Aquatic Environments

3.20.1.1. Increased Aquatic BOD

3.20.1.2. Water Transportable Degradation Products

3.20.1.3. Risk to Marine Species

3.20.2. Litter

3.20.3. Compost Toxicity

3.20.4. Recalcitrant Residues

3.20.4.1. Aromatic Compounds

3.20.5. Addigtives and Modifiers

3.20.5.1. Isocyanate Coupling Agents

3.20.5.2. Plasticisers

3.20.5.3. Fillers

3.20.5.4. Catalyst Residues

3.20.6. Prodegradants and Other Additives

3.20.7. Source of Raw Materials

3.21. Development of Australian Standards and Testing

3.21.1. Life-Cycle Assessment

3.21.2. Minimisation of Impact on Reprocessing

3.21.3. Determination of Appropriate Disposal Environments

3.21.4. Education

3.22. Conclusions

3.22.1. Identify standards and test methods for biodegradable plastics in Australia

3.23. Appendix A

4. BIOPLASTIC CARRY BAGS

4.1. A Climate-Friendly Brand

4.2. Main Applications

4.3. Reduce CO2 Emission with Bioplastics

4.4. Which Biobag to Choose?

4.5. Types of Bio Bag

4.6. Bio-Recyclable Bags can be Used to Create New Bags

4.7. Bio-Recyclable Bags do not Pollute the Recycling Process

4.8. Bio-Compostable Bags Break Down into Humus

4.8.1. Polyethylene (PE)

4.8.2. Polylactic Acid (PLA)

4.8.3. Thermoplastic Starch (TPS)

4.9. Bioplastics

4.9.1. Manufacturing Process

4.9.2. Recyclability of Plastic Materials

4.9.3. How Recycling Improvements Affect the Manufacturer

5. BIO-PET

5.1. Bio-PET as a Replacement for Virgin PET

5.2. Biodegradable Plastics

5.3. Biopolymer Plastic

5.4. Why is Bio-based Polyester Important?

5.5. The Benefits of Biopolymer Bottles

5.6. Biopolymer Bottle Types

5.7. Bottle-to-bottle Recycling

6. BIO PLASTIC DRINKING STRAWS

6.1. Types of Biodegradable Plastic Straws

6.1.1. Wheat Straws

6.1.2. Bamboo Straws

6.1.3. The Truth of Sugarcane Bagasse

6.1.4. Rice Straw

6.2. Technology Process

6.2.1. Pulp Bleaching Process

6.2.2. Pulp Washing Process

6.2.3. Pulp Cooking Process

6.2.4. Chemi-Mechanical Pulping

7. FOOD PACKAGING APPLICATIONS

7.1. Biobased Packaging Materials

7.2. Polymers Produced from Biomass

7.3. Polymers from Bio-derived Monomers

7.4. Polymers Produced from Micro-Organisms

7.5. Properties of Packaging Materials

7.5.1. Gas Barrier Properties

7.5.2. Moisture Barrier Properties

7.5.3. Mechanical and Thermal Properties

7.6. Biodegradability

7.6.1. Packaging Products from Bio based Materials

8. POLYVINYL MODIFIED GUAR-GUM BIOPLASTICS

8.1. Introduction

8.2. Modification of Guar Gum

8.3. Derivatization of Functional Groups

8.4. PVS Modified Guar Gum

8.5. Characterization

9. CORN AND RICE STARCH-BASED BIO-PLASTICS

9.1. Introduction

9.2. Materials and Methods

9.3. Extraction of Starch

9.4. Preparation of Bioplastics Film

9.5. Characterization

9.5.1. Tensile Test

9.5.2. Thickness Measurement

9.5.3. Test for Moisture Content

9.5.4. Water Solubility Test

9.5.5. Water Contact Angle Measurement

9.5.6. Biodegradability Test

9.5.7. Scanning Electron Microscopy (SEM)

9.5.8. Thermogravimetric Analysis

*9.5.9. Sealing Properties of Biopl*astics

10. BIOPLASTICS PROCESSING OF DRY INGREDIENTS

10.1. Introduction

10.1.1. Ingredient Properties Affecting Feedrates and Dry Ingredients Handling

10.1.2. Storage Hoppers and Ingredient Activation

10.1.3. Volumetric Feeders

10.1.4. Vibrating Tray Feeders

10.1.5. Belt Feeders

10.1.6. Loss-in-Weight Feeders

10.2. Start with a Traditional Feeding Device, Example a Screw Feeder

11. BIOPLASTICS – END-OF-LIFE OPTIONS

11.1. Recycling

11.1.1. Mechanical Recycling of Bioplastics

11.2. Renewable Energy Recovery (incineration)

11.3. Feedstock Recovery or Chemical Recycling

11.4. Compost/Biodegradation

11.4.1. Biodegradable

11.5. Anaerobic Digestion

11.5.1. Energy Recovery

11.6. Communicating End-of-Life Options

12. CASSAVA BAGS

12.1. Manufacturing Process

12.2. Types of Cassava Bags

13. PLASTICS FROM POTATO WASTE

13.1. Begin Insert

13.2. Plastics From Potato Waste

13.3. Starch to Glucose to Lactic Acid

13.4. Lactic Acid into Plastic

13.5. Potential Markets

14. BIODEGRADABLE SYNTHETIC POLYMERS

14.1. Formula of the Product

14.2. Introduction

14.3. Objective of the Present Invention

14.4. Preferred Embodiments

14.5. Claims

14.6. Conclusion

15. BIODEGRADABLE PLASTICS FROM RENEWABLE SOURCES

15.1. Plastics and the Environment

15.2. The Move to Renewable Sources

15.3. Extending the Recycling Loop

15.4. Biopolymers, Conventional Plastics and Biodegradable Plastics

15.5. Packaging

15.6. Plastic Films

15.7. Structure of the Business

15.8. Recent Developments

15.9. Biodegradability and Compostability

15.10. Challenges Ahead

16. BIODEGRADABLE PLASTICS FROM WHEAT STARCH AND POLYLACTIC ACID (PLA)

16.1. Introduction and Background

16.2. Results from Previous Funding

16.3. Rational and Significance

16.4. Procedures/Methodology

16.5. Other Related Works

17. STARCH BASED BIODEGRADABLE PLASTICS

17.1. Introduction

17.2. Technology Commercialization Model

17.2.1. Application of Technology Commercialization Model

17.3. Starch-based Biodegradable Plastics – Commercialization Case Studies

17.4. Conclusion

18. BIO-NANOCOMPOSITES FOR PACKAGING APPLICATIONS

18.1. Structure of Nano Composites Based on Natural Nano Fillers

18.1.1. Layered Silicate Filled Nano Composites

18.1.2. Cellulose Nanoparticles Filled Nano Composites

18.1.3. Starch Nano Crystals Filled Nano Composites

18.2. Properties of Bio-Nano Composites

18.2.1. PLA Based Bio-Nano Composites

18.2.2. Mechanical Properties

18.2.3. Barrier Properties

18.3. Starch Based Nano Composites

18.3.1. Elaboration Processes

18.3.2. Effect of the Surfactant and Plasticizer on the Structure

*18.3.3. Mechanical Pr*operties

18.4. Optical Properties

18.5. PHA Based Bio-Nano Composites

18.6. Proteins Based Nanocomposites

19. POLYHYDROXYALKANOATES (PHAS)

19.1. What are the General Characteristics of PHAs?

19.2. What are the Benefits of Bioplastics and PHAs in Particular?

19.3. What Applications have Utilized or can Utilize PHAs?

19.4. Materials and Methods

19.4.1. Reagents Preparation

19.4.2. Media Preparation

19.4.3. Sample Collection

19.4.4. Waste Collection

19.4.5. Isolation and Screening

19.4.6. Submerged Fermentation for PHA Production

19.4.7. Extraction of PHA Produced during Fermentation

19.4.8. Quantification of Produced PHA

19.4.9. Characterization of the Extracted PHA by FTIR

19.4.10. Molecular Identification of the Most Efficient PHA Producing Strain

19.4.11. Optimization of Cultural Conditions

19.4.12. PHA Film Preparation

*19.4.13. Statistical Analy*sis

20. POLYLACTIC ACID (PLA)

20.1. Introduction

20.1.1. PLA Film

20.1.2. PLA Trays and Other Thermoformed Products

20.1.3. PLA Bottles

20.1.4. Other Packaging Products

20.2. (Biodegradable) Starch based Plastics

20.2.1. Starch based Films

20.2.2. Starch based Trays and Other Thermoformed Products

20.2.3. Other Packaging Products

20.3. Cellophane Films

20.4. Biodegradable (and bio-based) Polyesters

20.4.1. Flexible Films based on Biodegradable Polyesters

20.4.2. Trays and Other Thermoformed Products

*20.4.3. Other Packaging Pro*ducts

20.5. Manufacture of Polylactic Acids

20.6. Influence of Optical Composition

21. BIODEGRADABLE TABLEWARE

21.1. Sugarcane Bagasse

21.1.1. Characteristics

21.1.2. Advantages

*21.1.3. Manufacturing Proc*ess

21.2. Cornstarch Tableware

21.2.1. Advantages

21.3. Bamboo Tableware

21.3.1. Features

21.3.2. Making Disposable Bamboo Tableware

21.3.3. Durable or Reusable

21.3.4. Benefits

21.4. Palm Leaf Tableware

21.4.1. Features

21.4.2. Eco-friendly

*21.4.3. Manufacturin*g Process

22. BIODEGRADABLE PLATES

22.1. Characteristics of Bagasse Products

22.2. Benefits of Using Biodegradable Plates

22.2.1. Saves Non-renewable Sources of Energy

22.2.2. Reduces Carbon Emission

22.2.3. Consumes Less Energy

22.2.4. Provides an Eco-Friendly Solution

22.3. Various Types of Disposable Plates

22.4. Disposable Bamboo Plates

22.5. Palm Leaf Plates

22.6. Bagasse Plates/ Sugarcane Plates

22.6.1. What is Bagasse? How is it used to Make Plates and Bowls?

22.7. Manufacturing Stages

22.7.1. Pulping

22.7.2. Forming

22.7.3. Shaping and Drying

22.7.4. Edge cutting and Sterilization

22.7.5. Packaging

23. BIODEGRADABLE TOILET PAPER

23.1. Types

24. BIODEGRADABLE POLYOLEFINS

24.1. Introduction

24.1.1. Results and Discussion

24.1.2. General Procedure for Grafting of Sugars onto Poly (styrene Maleic Anhydride)

24.1.3. Determination of Biodegradability of Polymers Using Aerobic Microo rganisms

24.2. Supplementary Data

24.2.1. Weight Loss Data

24.2.2. FTIR Spectral Data

24.2.3. Use of Colorimetry for Determination of the Sugar Content in the Poly(styrene Maleic Anhydride) Linked with Glucose: The Phenol-Sulfuric Acid Reaction Method

24.2.4. Quantification of Carbohydrate Groups Linked to Poly(styrene-Maleic Anhydride) by Silylation of the Carbohydrate Hydroxyl's and NMR Anlysis of the Spectrum

24.2.5. Molecular Weight Decrease After Biodegradation by GPC

24.2.6. Mechanism of Reaction of Poly(styrene Maleic Anhydride) with the Sugar

***25.* Paper Water Bottles**

25.1. Introduction

25.2. How Paper Bottles Differ from Others

25.3 Common Design and use

25.4. Food Contact and Barrier Performance

25.5. Advantages of this Venture

25.5.1 Environmental Advantages

25.5.2 Competitive Advantages

25.6. Market Demand

25.8.1. Global Market Drivers

25.8.2. Indian Demand Factors

25.8.3. Market Segmentation

25.7. Manufacturing Process

25.8. Raw Material Availability

25.9. Machinery Used in Manufacturing

25.10. Tips and Professional Guidance

26. STARCH FOR PACKAGING APPLICATIONS

26.1. Introduction

26.2. Bioplastic as Packaging Material

25.2.1. Why Use Starch as Packaging Material?

26.3. Characteristics of a Good Packaging Material

26.4. Recent Advances in Starch Based Composites for Packaging Applications

26.5. Plasticized Starch and Fiber Reinforced Composites for Packaging Applications

26.6. Protein-Starch Based Plastic Produced by Extrusion and Injection Molding

26.7. Starch-based Completely Biodegradable Polymer Materials

25.7.1. Starch: The Future of Sustainable Packaging

27. PLANT LAYOUTs, PROCESS FLOW CHARTs & DIAGRAMs

28. PHOTOGRAPHS OF Plant & MACHINERY WITH SUPPLIER'S CONTACT DETAILS

- Bio Degradable Bag Machine
- Corn Starch Biodegradable Bag Machine

- Biodegradable Compostable Bags Machine
- Biodegradable Carry Bag Cutting and Sealing Machine
- Biodegradable Carry Bag Machine
- Biodegradable Plastic Film Machine
- Blown Film Machine
- Areca Leaf Plate Machine
- Betel Leaf Plate Machine
- Areca Food Container Machine
- Bagasse Tableware Pulp Molding Machine
- Pulp Molded Tableware Machinery
- Eggs Pulp Tray Machine
- Biodegradable Pulp Cup Rotary Machine
- Biodegradable Paper Straw Making Machine
- Biodegradable Straw Making Machine
- Biodegradable Shopping Bag Making Machine
- Automatic Cassava Starch Bag Making Machine
- Sugarcane Bagasse Tableware Making Machine
- Rotary Thermoforming Pulp Moulding Machine
- Paper Coating Machine
- Paper Bottle Assembly Machine
- Paper Pulp Board Calender Machine

29. References 443

About Niir

NIIR Project Consultancy Services (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. Its various services are: Pre-feasibility study, New Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Preparation of Project Profiles and Pre-Investment and Pre-Feasibility Studies, Market Surveys and Studies, Preparation of Techno-Economic Feasibility Reports, Identification and Selection of

Plant and Machinery, Manufacturing Process and/or Equipment required, General Guidance, Technical and Commercial Counseling for setting up new industrial projects and industry. NPCS also publishes various technology books, directories, databases, detailed project reports, market survey reports on various industries and profit making business. Besides being used by manufacturers, industrialists, and entrepreneurs, our publications are also used by Indian and overseas professionals including project engineers, information services bureaus, consultants and consultancy firms as one of the inputs in their research.