

# Biopolymers for Packaging

## 2010 to 2014

### Section I:

#### Introduction

- A. Study purpose
- B. Key definitions
  - 1. Biopolymers
  - 2. Synthetic polymers
  - 3. Thermoplastic property
  - 4. Biodegradability and compostability
- C. Study organization
- D. Geographic regions
- E. Study methodology
- F. Conventions

### Section II:

#### Executive Summary

- A. Technology
  - 1. Raw materials
  - 2. Production processes
  - 3. Biopolymer processing and product performance
  - 4. End-of-life alternatives
  - 5. Biopolymer capacity
- B. Economic and environmental analysis
  - 1. Economics
  - 2. Environmental
- C. Market trends and drivers
  - 1. Greenhouse gas reduction
  - 2. Renewable sourcing
  - 3. Biodegradability
  - 4. Recyclability
  - 5. Drop-in replacements
  - 6. Synthetic polymer prices
- D. Market projection
  - 1. Global biopolymer resin consumption
  - 2. Biopolymer consumption in packaging segmented by plant source

3. Biopolymer consumption in packaging segmented by end-use
4. Biopolymer consumption in packaging segmented by package type
5. Biopolymer consumption in packaging by geographic region

### **Section III:**

#### **Technology**

- A. Raw materials
  1. Starches
  2. Sugars
  3. Plant oils
  4. Proteins
  5. Cellulose
- B. Monomers and polymers
  1. Polylactic acid (PLA)
  2. Polyhydroxyalkanoate (PHA)
  3. Polyethylene terephthalate (PET)
  4. Polytrimethylene terephthalate (PTT)
  5. Polyurethane (PU)
  6. Polyethylene (PE)
  7. Polyvinyl chloride (PVC)
  8. Cellulose ester (CE)
  9. Thermoplastic starch (TPS)
- C. Converting to packaging
  1. Polylactic acid (PLA)
  2. Thermoplastic starch (TPS)
  3. Polyhydroxyalkanoate (PHA)
- D. End-of-life options
  1. Biodegradability
  2. Composting
  3. Global compostable certifications
  4. Industrial and home composts
  5. Biopolymer compostability
  6. Composting alternatives
- E. Research and development
  1. Improve biopolymer performance
  2. Reduced production cost
  3. Improved environmental metrics
  4. Other
- F. Biopolymer Production Capacities
  1. Polylactic acid (PLA)
  2. Polyhydroxyalkanoate (PHA)

3. Polytrimethylene terephthalate (PTT)
4. Polyethylene terephthalate (PET)
5. Polyurethane (PU)
6. Polyethylene (PE)
7. Polyvinyl chloride (PVC)
8. Cellulose ester (CE)
9. Thermoplastic starch (TPS)

#### **Section IV:**

##### **Economic and Environmental Impact**

- A. Economics
  1. Economy of scale
  2. Pricing strategy
  3. Raw material costs
- B. Environmental impact
  1. Life cycle analysis
  2. Projection
  3. End-of-life alternatives

#### **Section V:**

##### **Market Trends/Projections**

- A. Global biopolymer market
  1. Polylactic acid (PLA)
  2. Polyhydroxyalkonate (PHA)
  3. Polyurethane (PU)
  4. Polytrimethylene terephthalate (PTT)
  5. Polyethylene terephthalate (PET)
  6. Polyethylene (PE)
  7. Polyvinyl chloride (PVC)
  8. Cellulose ester (CE)
  9. Thermoplastic starch (TPS)
  10. Other
- B. Biopolymers in packaging - market drivers and trends
  1. Renewable sourcing
  2. Biodegradability
  3. Compostable certifications
  4. Legislation
  5. Environmental strategy
  6. End-of-life alternatives
  7. Manufacturing cost

8. Drop-in replacements
  9. Consumer preference
  10. Land use competition
  11. Genetic research
  12. Joint ventures
  13. Environmental performance
  14. Controlled waste markets
  15. Market specific drivers
- C. Polylactic Acid (PLA)
1. Current status
  2. Projection
  3. Supplier sales
  4. PLA consumption in packaging – value
  5. PLA consumption in packaging segmented by end-use
  6. PLA consumption in packaging segmented by package type
- D. Polyhydroxyalkonates (PHA)
1. Current status
  2. Projection
  3. Supplier sales
  4. PHA consumption in packaging – value
  5. PHA consumption in packaging segmented by package type
- E. Polytrimethylene terephthalate (PTT)
1. Current status
  2. Projection
  3. Supplier sales
  4. Bio-PTT consumption in packaging – value
  5. Additional projections
- F. Polyethylene terephthalate (PET)
1. Current status
  2. Projection
  3. Supplier sales
  4. Bio-PET packaging value
  5. Additional projections
- G. Polyurethane (PU)
1. Current status
  2. Projection
  3. Supplier sales
  4. Bio-PU consumption in packaging – value
  5. Additional projections
- H. Polyethylene (PE)
1. Current status

2. Projection
  3. Supplier sales
  4. Bio-polyethylene consumption in packaging – value
  5. Bio-PE consumption in packaging segmented by package type
- I. Polyvinyl chloride (PVC)
    1. Current status
    2. Projection
    3. Supplier sales
    4. Bio-PVC consumption in packaging – value
    5. Additional projections
  - J. Cellulose esters (CE)
    1. Current status
    2. Projection
    3. Supplier sales
    4. Packaging consumption value
    5. Cellulose ester consumption in packaging by package type
  - K. Thermoplastic starch (TPS)
    1. Current status
    2. Projection
    3. Supplier sales
    4. TPS consumption in packaging – value
    5. TPS consumption in packaging segmented by package type
  - L. Other
    1. Current status and projections
    2. Packaging consumption value
  - M. Summary
    1. Packaging consumption summary
    2. Biopolymer sales summary segmented by supplier
    3. Biopolymer consumption in packaging – value summary
  - N. Biopolymer consumption in packaging by plant source
    1. Corn
    2. Other starch plants
    3. Sugar cane
    4. Other sugar plants
    5. Soybean
    6. Other oil based plants
    7. Other
  - O. Biopolymer consumption in packaging segmented by end-use
    1. Retail food
    2. Retail non-food
    3. Foodservice
    4. Other

- P. Biopolymer consumption in packaging by package type
  - 1. Trays and bowls
  - 2. Pots
  - 3. Flexible film and lidstock
  - 4. Bottles, jars, and tubes
  - 5. Bags and pouches
  - 6. Waste bags
  - 7. Cups, cartons, and corrugated
  - 8. Transportation packaging
  - 9. Other
  - 10. Summary
- Q. Biopolymer consumption in packaging by geographic region
  - 1. North America
  - 2. Europe
  - 3. Asia
  - 4. ROW

**Section VI:**

**Producer Profiles**

**Section VII:**

**Glossary**

**10 Figures**

**62 Tables**