Special Report (sample)

Front Runners in Sustainable Material Technologies

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INTRODUCTION

About this report:

- This report provides a comprehensive overview of the leading players active in developing sustainable materials globally. These players can be start-ups or mid-sized companies having focused on their proprietary sustainable material platform. Established players, conglomerates, research institutions and laboratories have not been captured.
- Sustainable materials covered can be polymer resins, polymeric films, coatings, and foam-like materials, natural fibers and moldable articles made thereof.
- Each player has been profiled separately by outlining details around its technology, financials, relevant markets and intellectual property. Further, a 20-point assessment based on Aranca 5 Factor Assessment Framework has been provided for each player.

Relevant audience:

- ✓ Companies already present in the domain or willing for entering into it
- ✓ Established companies and conglomerates willing to explore and acquire start-ups
- ✓ Venture capitalists (VCs), institutional and individual investors

Customization:

- Report contents can be customized based on user requirements. Accordingly, report coverage shall be reduced or expanded to the specific areas of interest.

SUMMARY

Sustainable Material Technologies

- Traditional plastic materials are being challenged by growing concerns around environment pollution and sustainability. Essentially, this has now become a prime concern to all domains and adoption of sustainable materials is currently of utmost importance.
- Sustainable materials can help in reducing carbon foot-print, as they are recyclable or biodegradable, and can also help in enhancement of brand image. With government regulations and policies favoring sustainability, demand for sustainable materials is expected to grow in the coming years.
- Development of materials such as natural fibers, resins, and biodegradable polymers that can be produced and traded locally, provide growth and business to the community.
- Technological innovation plays a crucial role in sustainability. Various technologies are being developed over the years which can make optimal use of available natural resources.
- Entry of established players in the domain, limited adoption, fragmented market, need for process standardization, scalability and related cost remain as key challenges for these materials. Despite the challenges, targeting the right market, technology and partners in the domain can benefit in achieving the sustainability goals.

Aranca Report Overview

- In this report, Aranca has captured innovative and scalable technologies from the most promising entities in the domain of sustainable materials.
- Identified front runners in sustainable materials technology were evaluated using Aranca's 5 factor framework namely comprising of:
  - ✓ Intellectual property
  - ✓ Technology
  - ✓ Financial and market
  - ✓ Organization
  - ✓ Ecosystem
- Going beyond the biodegradable polymers, Aranca has also captured unique companies producing degradable leathers, spider-silk fibers, water soluble polymers, smart textiles, etc.
- Apart from identifying the targeted materials and technologies, Aranca can extend the current study to provide support in:
  - ✓ Competition assessment
  - ✓ Market assessment and outlook
  - ✓ IP and commercial product landscapes
  - ✓ Route-to-market intelligence, e.g., key technologies, potential M&A targets, regulatory aspects, etc.

Note: This is one in the series of reports published on sustainability theme. Other reports such as Front Runners in **CO2 Utilization Technologies, Sustainable Fuels, Sustainable Polymeric Composites** are also available.

RESEARCH METHODOLOGY

Methodology

- A comprehensive search was performed on various platforms to map relevant technology developers. Mapped entities were scrutinized for relevancy based on the technology and product offerings.
- Entities with establishment year 2008 onwards have been considered, however, this has not been considered strictly in order to capture all relevant players.
- Each relevant player was evaluated on five important factors namely intellectual property, technology, financials, ecosystem and organization (refer Aranca 5 Factor Framework for more details).
- Corporate players and diversified entities with partial focus on sustainable material technology were excluded.
- Focused secondary research was conducted for the captured players in order to capture relevant insights. In order to fill the gaps remaining after this, primary research was conducted, wherever necessary.

Information Sources

Following paid and public sources of information were referred (not exhaustive):

- Patents on databases such as Thomson Innovation and Questel Orbit
- Scientific literature published on databases such as ScienceDirect, ResearchGate, Scopus, SpringerLink and Wiley Online
- Company websites, product brochures and news/media sections
- Industry associations and Government sources such as European Commission, European Bioplastics and Ellen MacArthur Foundation
- Specific publications/magazines on bio-based and biodegradable materials
- Other commercial databases such as Factiva, Bloomberg and EMIS to capture/validate company-specific information
- Aranca internal knowledgebases and industry experts

ARANCA 5 FACTOR ASSESSMENT FRAMEWORK

Factor	Parameter	Score (1−5); higher is better					Min	Max
Intellectual Property	No. Of Patents						3	15
	Citations/Year							
	Patent Status							
Technology	Novelty						5	25
	Scope							
	Scalability							
	Competitiveness							
	TRL							
Financials	Total Funding						5	25
	Funding Rounds							
	Type of Investor							
	No. of Investors							
	Revenues							
Ecosystem	Target Industry Size						3	15
	Policies & Regulations							
	Environmental Impact							
Organization	Global Presence						4	20
	Employee Size							
	Active Years							
	Awards/Recognition							

Notes:

- Total score is obtained by adding the individual factor scores.
- For uniform representation, final score is normalized on a 0-100 scale and factor scores are adjusted accordingly.

REPORT OVERVIEW

56 companies actively working in the domain of sustainable material technologies since 2008

Inclusion of both bio-based and biodegradable commercialized products in a single platform

Holistic assessment in terms of IP, technology, financial, ecosystem and organization

Entities range from start-ups to potential disruptors to major players*

In depth analysis and key observations for each entity

Information covered on each company

Company information

- Website, year of establishment, headquarters, key personnel, etc.
- Size (employee count, revenue, funding, etc.)
- Awards and recognition

Technology

- Technology readiness level (TRL)
- Feedstock, conversion process and output
- Patents and research collaborations

Commercialization

- Applications and markets
- Product details (form, chemistry, trade name, etc.)
- Business partnerships, investments

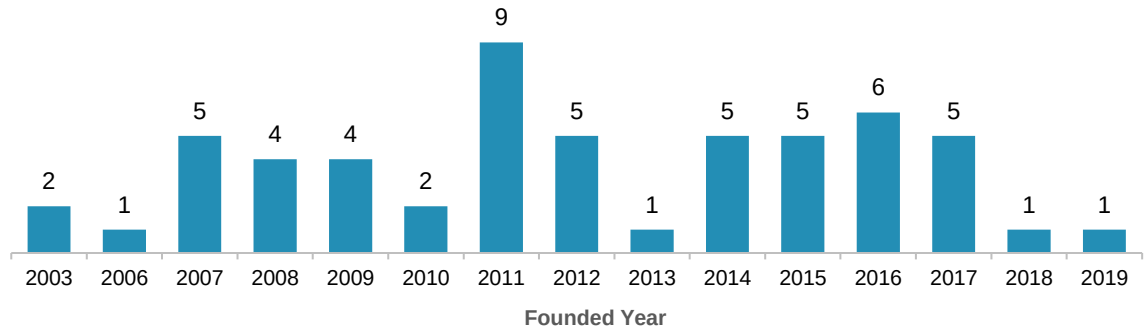
**Players with diversified business portfolio are excluded*

HIGHLIGHTS

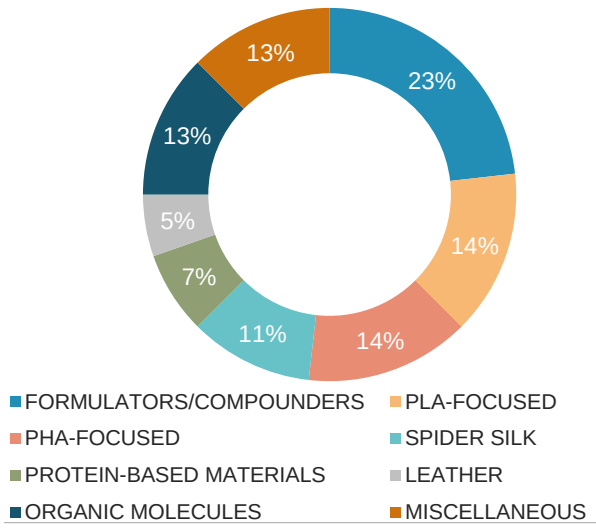
Summary

Companies covered	56
Geographic focus	Global
Materials	Polymer resins, polymeric films, coatings, and foam-like materials, natural fibers, spider silk, leather and articles made thereof.

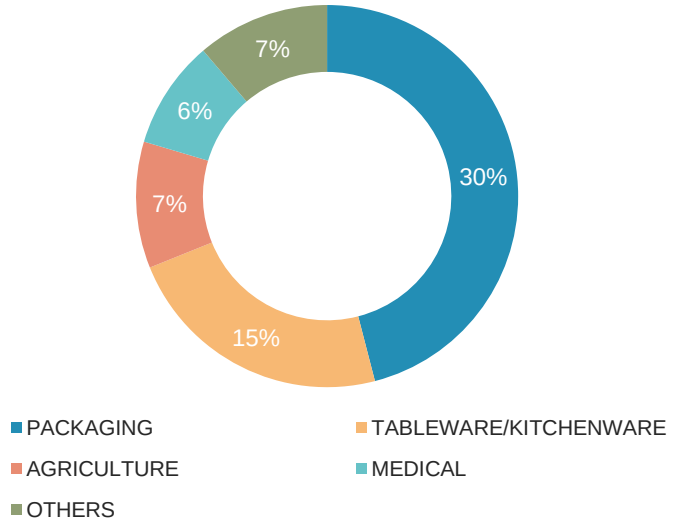
Companies By Maturity



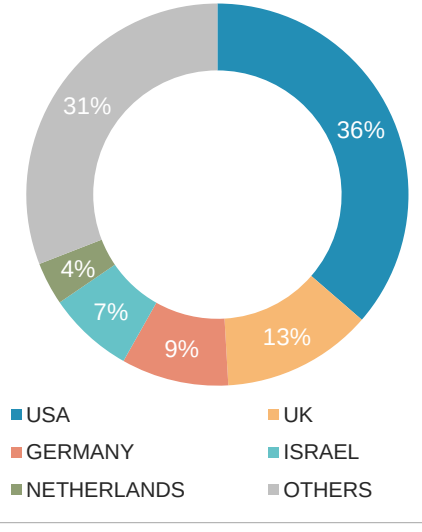
Companies By Category



Application Focus



Regional Coverage



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KEY CATEGORIES AND COMPANIES (EXAMPLES)

Biomaterial Formulators/ Compounders

biome bioplastics

Polylactic acid (PLA) Focused

cellulac

Polyhydroxyalkanoate (PHA) Focused

TerraVerdae BIOWORKS

Spider Silk

Spiber

Protein-based materials

TETHIS™

Leather

ECOVATIVE DESIGN

Organic Molecules (Bio-derived chemicals)

Itaconix

Miscellaneous

BIOPOLIX
Biotecnologia para sustentabilidade

CuanTec

SAMPLE COMPANY PROFILE

Website: Link
Est.: 2007
HQ: UK

Biome Bioplastics Ltd, wholly owned subsidiary of Biome Technologies plc, **develops and manufactures bioplastic compounds using biobased/ biodegradable polymers, natural materials and other additives.** With the help of their patent technologies and strong R&D, they have customers by providing service and support as per their needs.

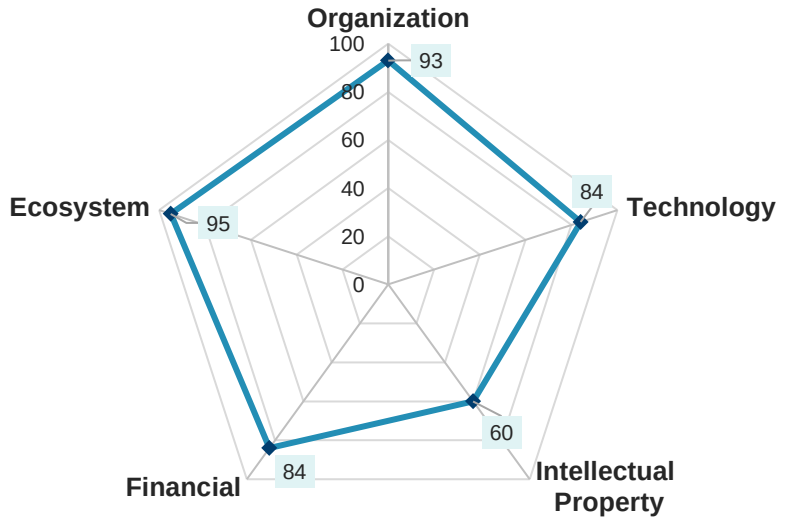
Technology
- Feedstock: Starch, PLA or PHA
- Process: Polymerization, biotechnology and compounding
- Key products: Pellets/powder of blended polymers
- TRL: Matured

Financials
- Total revenue: $ 2.51 mn
- Total invested amount: N/A
- Investors: Public (Listed on London Stock Exchange as Biome Technologies plc)

Operations
- Plants in US and Germany
- R&D centers in UK

Applications
- Tableware/Dishware
- Packaging for food and cosmetics
- Thermoformed articles for electronics, automotive and industrial applications

Aranca 5 Factor Assessment 84/100



Note: Factor scores have been normalized on a 0-100 scale. Detailed analysis has been provided in the next slide.

Aranca Observations
- Strong expertise in manufacturing heat-resistant, chemical-resistant and functionally high-performance bioplastics which other players have struggled to achieve
- Strong IP and R&D

Overall Rating

biome bioplastics

Aranca 5 Factor Assessment

Final Score 84/100

		Criteria	Low 1	2	Score 3	4	High 5	Total
Intellectual Property	▪ Strong IP portfolio of 11 patents, four of which have been granted	No. Of Patents				4		9
		Citations/Year			3			
		Patent Status		2				
Technology	▪ Final blends have better performance and can be tailored according to final applications ▪ With many years of experience and intensive R&D, scalability is not a concern	Novelty			3			21
		Scope					5	
		Scalability				4		
		Competitiveness				4		
		TRL					5	
Financial	▪ With parent company already listed, funding has been good ▪ Funding is also available through collaborations and government grants	Total Funding				4		21
		Funding Rounds					5	
		Type of Investor					5	
		No. of Investors					5	
		Revenues		2				
Ecosystem	▪ Applications are targeted beyond conventional packaging and food industry ▪ Benefits from single-use plastic regulations	Target Industry Size				4		14
		Policies & Regulations					5	
		Environmental Impact					5	
Organization	▪ Supplies to major markets in the US and Europe ▪ Around 15 years of experience in the domain	Global Presence						19
		Employee Size						
		Active Years						
		Awards/Recognition				4		

biome bioplastics

With strong IP, extensive R&D, multiple partners and funds in place, Biome has strong potential to become a major player in the sustainable material space

Patents

- Total **11 patents,** with 4 granted and 3 lapsed while the rest are in pending state
- Patents mainly disclose **formulations and preparation process**
- **Starch and FDCA** are the major chemistries disclosed. Also, a couple of patents disclose cellulose acetate, PHA and PLA.
- **Single-use plastic packaging** has been the major application focus
- Most of the patents disclose **biodegradability/composability**

Financial

- In **2019**, the revenue rose about **50%** vis-à-vis the previous year **to $ 1.53 million**
- Also, in 2019, it raised around **$ 1.5 million** in share pricing. This fund would be used for capacity scale-up in the US and Germany, and in R&D of industrial biotechnology.

Research and Development

- **Scaling up industrial biotechnology** using biomass input to produce bioplastics of outstanding functionality
- Production of **various chemicals from lignin** using bacteria

Collaborations and Partners

- Demonstrated compostable multilayer packaging in partnership with **Futamura**
- Other partners include **University of Nottingham, University of Liverpool, University of Leeds, University of York, University of Warwick and Centre for Process Innovation**

aranca

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& ADVISORY

INVESTMENT RESEARCH
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PROCUREMENT & SUPPLY
CHAIN INTELLIGENCE