Driving the evolution of plastics – bioplastics markets and framework

Roland Scharathow, European Bioplastics
European Bioplastics - history

- European Bioplastics is the representation of the bioplastics industry in Europe.
- Its members are companies from the agricultural feedstock, chemical and plastic industries, as well as industrial users and recycling companies.
### Members of European Bioplastics – The value chain*

**Chemicals / Plastics Producers**

- BASF
- Braskem
- DuPont
- Innofarm
- NatureWorks
- Novamont
- Purac
- Roquette

**Converters**

- Amcor
- Goglio
- Huhtamaki
- Sig
- Solo
- Stora Enso
- Tetra Pak

**Users & Brands**

- Finestra
- Coca-Cola
- Coefresco
- Danone
- Ferrero
- Kraft

**Recycling**

- Der Grüne Punkt
- Interseroh

*selection of our members in 2012.*
What are bioplastics?
“Bioplastics are biobased, biodegradable or both.”

European Bioplastics
Material coordinate system for bioplastics

- Biopolymers: Based on renewable raw materials, e.g., Bio-PE (PP/PET), biobased PA, PTT
  - Not biodegradable

- Conventional Polymers: Nearly all conventional plastics, e.g., PE, PP, PET
  - Petrochemical raw materials

- Biopolymers: Are biodegradable and based on renewable raw materials, e.g., PLA, PHA, Starch blends

- Biopolymers: Are biodegradable, e.g., PBAT, PBS, PCL
  - Biodegradable

Source: Ifbb, University of Applied Sciences and Arts, Hanover
### Examples of bioplastic materials and manufacturers

<table>
<thead>
<tr>
<th>Biodegradable / Compostable</th>
<th>Biodegradable AND Compostable</th>
<th>Biobased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthetic polyesters (BASF, Mitsubishi, a.o.)</td>
<td>Polylactide PLA (NatureWorks, Purac/Synbra, Futerro)</td>
<td>Bio-PDO based polymers (DuPont)</td>
</tr>
<tr>
<td>Polyvinyl alcohol</td>
<td>Starch based materials (Novamont, Sphere-Biotec, Plantic, a.o.)</td>
<td>PE from bioethanol (Braskem, DOW)</td>
</tr>
<tr>
<td></td>
<td>Cellulose based materials (Innovia, a.o.)</td>
<td>PET from bioethanol (Coca-Cola)</td>
</tr>
<tr>
<td></td>
<td>PLA compounds / blends (BASF, FKuR. a.o.)</td>
<td>PVC from bioethanol (SolVin, announced)</td>
</tr>
<tr>
<td></td>
<td>Polyhydroxyalkanoate PHA (Telles, Kaneka, a.o.)</td>
<td>PP from bioethanol (Braskem)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polyamides PA 6.6.9/ 6.10/11 (Arkema, BASF, a.o.)</td>
</tr>
</tbody>
</table>
The bio-economy and bioplastics

- The chemical and the plastics industries are key sectors for a prosperous and competitive Europe.
- The EU meets current economic and environmental challenges by supporting the concept of the bio-economy.
- Bioplastics are key materials driving the evolution of plastics and are...
- Consequently an important pillar of the bio-economy.

**Agriculture**
- corn
- sugar cane
- wood
- straw
- castor plant

**Agricultural Feedstocks**
- starch
- sugars
- fats
- oils

**Chemical Industry**
- intermediates
- platform chemicals

**Plastics Industry**
- batches
- granulates

**Bioplastics Consumer products**
- packaging
- electronics
- automotive

**Recycling Recovery**
- organic recycling
- mechanical recycling
- thermal recovery
The bio-economy: facilitating growth

- New and innovative concepts are developed and researched: biorefineries, C-building blocks, platform chemicals
- A multitude of very diverse applications is already available
Market – strong growth, new trends
**Bioplastics - multiple benefits on different levels**

<table>
<thead>
<tr>
<th>Environment</th>
<th>Functionality</th>
</tr>
</thead>
</table>
| • Climate protection | • New applications  
• Enhanced performance |

<table>
<thead>
<tr>
<th>Renewable Resources</th>
<th>End of life</th>
<th>Social Dimension</th>
</tr>
</thead>
</table>
| • Security of supply chain  
• Reduced oil import dependency  
• New and innovative materials  
• Cascade use: First industrial use, then energy production  
• Increased use of platform chemicals (e.g. bio-based succinic acid)  
• Mid-term: Biorefineries  
• Mid-term: Economics (rising oil price/peak oil) | • Mechanical Recycling  
• Organic Recycling  
• Thermal Recovery  
• Feedstock Recovery | • Consumer acceptance  
• Jobs  
• Option to develop rural areas |
Global production capacities (Status 2011)

Source: European Bioplastics / University of Applied Sciences and Arts Hanover (Status May 2011)
Global production capacities (per region)

Production capacity of biopolymers in 2010 (by region)

- Europe: 0.5 in %
- Asia: 27.6 in %
- North America: 26.7 in %
- South America: 18.5 in %
- Australia: 26.7 in %

Total: 725,000 t

Production capacity of biopolymers in 2015 (by region)

- Europe: 0.2 in %
- Asia: 32.9 in %
- North America: 20.5 in %
- South America: 18.3 in %
- Australia: 28.1 in %

Total: 1,710,000 t

Source: European Bioplastics | University of Applied Sciences and Arts Hanover
Biopolymers production capacity 2010 (by type)

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-PE</td>
<td>200,000</td>
<td>28%</td>
</tr>
<tr>
<td>Biodegradable Starch Blends</td>
<td>117,800</td>
<td>16%</td>
</tr>
<tr>
<td>PLA</td>
<td>112,500</td>
<td>15%</td>
</tr>
<tr>
<td>PHA</td>
<td>88,100</td>
<td>12%</td>
</tr>
<tr>
<td>Biodegradable Polyesters</td>
<td>56,500</td>
<td>8%</td>
</tr>
<tr>
<td>Bio-PET</td>
<td>50,000</td>
<td>7%</td>
</tr>
<tr>
<td>Regenerated Cellulose(^2)</td>
<td>36,000</td>
<td>5%</td>
</tr>
<tr>
<td>Bio-PA</td>
<td>35,000</td>
<td>5%</td>
</tr>
<tr>
<td>Cellulose Derivatives(^3)</td>
<td>8,000</td>
<td>1%</td>
</tr>
<tr>
<td>PLA-Blends</td>
<td>8,000</td>
<td>1%</td>
</tr>
<tr>
<td>Durable Starch-Blends</td>
<td>5,100</td>
<td>1%</td>
</tr>
<tr>
<td>Others</td>
<td>7,500</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>724,500</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

\(^1\) only cellulose ester \(^2\) only hydrated cellulose foils

Source: European Bioplastics | University of Applied Sciences and Arts Hanover
Biopolymer production capacity 2015 (by type)

<table>
<thead>
<tr>
<th>Material</th>
<th>Capacity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-PE</td>
<td>450,000</td>
<td>26%</td>
</tr>
<tr>
<td>Bio-PET</td>
<td>290,000</td>
<td>17%</td>
</tr>
<tr>
<td>PLA</td>
<td>216,000</td>
<td>13%</td>
</tr>
<tr>
<td>PHA</td>
<td>147,100</td>
<td>9%</td>
</tr>
<tr>
<td>Biodegradable Polyesters</td>
<td>143,500</td>
<td>8%</td>
</tr>
<tr>
<td>Biodegradable Starch Blends</td>
<td>124,800</td>
<td>7%</td>
</tr>
<tr>
<td>Bio-PVC</td>
<td>120,000</td>
<td>7%</td>
</tr>
<tr>
<td>Bio-PA</td>
<td>75,000</td>
<td>5%</td>
</tr>
<tr>
<td>Regenerated Cellulose*</td>
<td>36,000</td>
<td>2%</td>
</tr>
<tr>
<td>PLA-Blends</td>
<td>35,000</td>
<td>2%</td>
</tr>
<tr>
<td>Bio-PP</td>
<td>30,000</td>
<td>2%</td>
</tr>
<tr>
<td>Bio-PC</td>
<td>20,000</td>
<td>1%</td>
</tr>
<tr>
<td>Others</td>
<td>22,300</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,709,700</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

*only hydrated cellulose foils

Source: European Bioplastics | University of Applied Sciences and Arts Hanover

Fachhochschule Hannover
University of Applied Sciences and Arts
Applications today and tomorrow
Product innovation: Coca-Cola (Bio-PET, Bio-PE)
Product innovation: Danone (bio-PE, bio-PET)
Product innovation: Danone (PLA)
Product innovation: Procter & Gamble (Bio-PE)
Product innovation: Johnson & Johnson (Bio-PE)
Latest product news: The Barrette Factory (algae-based plastic)
**Product innovations: retail chains (bio-PE, PLA-blends)**
Product innovation: Toyota Prius (partly biobased polyamides)
Product innovation: Eops 'Noisezero O+ Eco edition over-ear headphones’ (cornstarch based plastic)
Product innovation: Drum cover of Fuji Xerox Copy Machine
Product innovation: Laptop bags (partly biobased polyamides)
End-of-life options
Post-consumer bioplastics
Certification – proving reliability
Supporting common certification & labelling

- European Bioplastics seeks and actively supports the certification according to acknowledged standards
- Independent third party certification
- Labels for product identification and proper disposal
- EU wide implementation of labels and certification schemes

* European Bioplastics signed a voluntary self-commitment to use certification and labelling
The seedling - a reliable label for compostability

- Composting (= organic recycling) must be protected from harmful input (high sensitiveness)
- Biodegradable / compostable products must* be certified according to EN 13432 / 14995 standard
- Independent third party certification approves conformity between tested and marketed product
- Product identification tool: The "seedling" label™ assists the buying decision and a proper disposal (sorting)
- Certification & labelling must be implemented EU wide (schemes already established in B, CH, D, NL, PL, UK)

*EU industry signed a voluntary self-commitment to use certification and labelling.
Renewable resources – the pros and cons

- Benefits of using renewable resources are continuously gaining edge as, e.g. efficiency in sourcing increases or the principle of cascade use is taken into account

- CO₂-storage in plants
- Atmospheric carbon bound in product
- Saving of fossil resources
- Security of supply
- Development of rural areas

- THG – emissions of agriculture
- Irrigation
- Eutrophication/ acidification
- Food vs. fuels discussion
- Land use change
- Biodiversity
Renewability certification and labels in the EU

• 14C based systems
  > DINCERTCO
  > VINCOTTE
**Sustainable biomass production**

- Critical issues of bio-feedstocks from agriculture:
  - Eutrophication, water footprint, GHG emissions from agriculture, food vs. tank debate, (indirect) land use change, impact on biodiversity
- Approaches to these issues have been existing for some time, e.g. FSC for wood/paper
- EU Renewable Energy Directive (RED); minimum criteria for biofuels
- First certification systems for RED compliance are going online (ISCC, REDcert)
- Announcements of EC and several members states to look into “other biomass applications”, e.g Germany: Feed and Food.
NEW - Environmental Communications Guide

- The guide gives an overview of general guidelines for environmental communication and specific recommendations for bioplastics.
- Available for download (free!) at http://en.european-bioplastics.org/multimedia/
Strong support by policy makers for full market penetration
**EU: political framework to be optimised**

**Research/development**
- Doing fine...
  - Diverse projects and strategies under FP7, CIP etc.
  - Budget increase planned in „Horizon 2020“

**Demonstration**
- On the way...
  - Support growing, importance recognised
  - First biorefinery prototypes planned/under construction

**Implementation**
- Missing...
  - No supportive framework in place
  - No visible strategy
  - Implementation and scale-up may not happen in EU
Policy Support for bioplastics – EU Initiatives

- Europe 2020
  - Innovation Union „Bioeconomy“ (since 2010)
  - Bioeconomy Strategy (2012)
  - Ressource Efficiency (2011)
- Lead Market Initiative for bio-based products (LMI)
  - LMI (since 2007)
  - Report with policy recommendations (2009)
  - Updated priority recommendations (2011)
  - Standardisation for biobased products ongoing
- Legal Framework Waste & Packaging
  - Measures concerning shopping bags…?
  - Revision of PPWD announced for 2014
  - Green paper on waste strategy expected 2012
7th EuBP Conference – Berlin, 6/7 November 2012

• With over **420 visitors** the European Bioplastics Conference is the **leading event of the bioplastics industry**.

• Each year it provides excellent opportunities to exchange information and network with the global industry leaders.

• **2012 with enlarged exhibition space!**

• Fore more information see: [www.conference.european-bioplastics.org](http://www.conference.european-bioplastics.org).
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