Biomass
a true alternative
to petroleum

Transforming non-edible biomass into high performance products to create new value from wood & agricultural residues
100 million barrels
Every Day!
100 million barrels
Every Day!
100 million barrels Every Day!
Fossil resources = Modern life!

100 million barrels Every Day!
Challenge

Where do we stand?

Catalytic upgarding

Fossil resources = Modern life!

©2007 IPCC WG1 AR-4
Challenge

Cellulose
Hemicellulose
Lignin

Bloom

Deconstruction

Catalytic upgrading

5 patents

Questell-Santiago et al., Nature Chemistry, 10, 12, 1222-1228, 2018
Amiri et al., Nature Protocols, 14, 921-954, 2019

Modern life!
Biomass as a starting material

Using Aldehyde Assisted Fractionation (AAF), Bloom can - for the first time - stabilise and/or functionalise natural polymers.

Biomass composition

<table>
<thead>
<tr>
<th></th>
<th>Cellulose</th>
<th>Hemicellulose</th>
<th>Lignin</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Today</td>
<td>40%</td>
<td>15%</td>
<td>20%</td>
<td>25%</td>
</tr>
</tbody>
</table>

Chemical details in supplementary slides
Biomass as a starting material

Using Aldehyde Assisted Fractionation (AAF), Bloom can - for the first time - stabilise and/or functionalise natural polymers.

### Biomass composition

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Chemical details in supplementary slides

5 patents
Allegory of the egg

Aldehyde Assisted Fractionation (AAF) can be compared to the fractionation of part of an egg, if done right.

<table>
<thead>
<tr>
<th>Egg composition</th>
<th>Today</th>
<th>Tomorrow</th>
</tr>
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<tbody>
<tr>
<td>Egg white</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>Yolk</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Shell</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>2%</td>
<td></td>
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Products
Allegory of the egg

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Products
Products enabled - selected list

Cellulose
- Textile fibbers (13 B€)
  - More

Hemicellulose
- Bioplastic (PET-like) (22 B€)
  - More

Lignin
- Bunker fuels (>100 B€)
- Cosmetics (69 B€)
- Inks (3 B€)
- Fragrances (24 B€)
  - More

Customers
- Textile fibbers
- Bioplastic
- Bunker fuels
- Cosmetics
- Inks
- Fragrances

Partners
- Textile fibbers
- Bioplastic
- Bunker fuels
- Cosmetics
- Inks
- Fragrances
Roadmap

Licensing

Manufacturing

Technology

Proof of Concept
- 1g
- 2016

Lab-scale
- 1kg
- 2018

Pilot
- 50t/y
- 2020

Demo
- 10,000 t/y
- 2022

Commercial
- 100,000 t/y
- 2024

Pre-seed
- €0.5M
- 2016

Seed
- €3.9M
- 2022

Technology licensing
- Series B
- 2024

Fundraising

Grant & Prize
- 44%
- €3.9M
- 2016

Equity
- 56%
- 2022

Series A + grants
- €30-55M
- 2024

%
Let’s join forces

Dr. Remy Buser
Co-founder & CEO

Route de l’Ancienne Papeterie 106
1723 Marly
Switzerland

Supporters

Target
SDGs
Supplementary slides
Team

Management
Operations
Dr. Florent Héroguel
Dr. Remy Buser

Strategy
Prof. Jeremy Luterbacher
Matthias Währer

Board Members
Gaetan Bonhomme
Sophie Rouzeau

Sales
Sofia Antunes

15 FTEs
Serial entrepreneurs
Scientific excellence
Industry expertise

Pilot operation
Chloé Wegmann*
Vincent Pilloud*
Lucien Blanchard
Romain Aquoise

Process
Antoine Bourgeois
Dr. Etienne Gatt
Marie Jones*
Ruoxing Liao

Safety

Production and scale-up

Products development
Lignin products
Dr. Monique Figuière
Dr. Ydna Questell
Christèle Rayroud*

Biomaterials
Dr. Philip Scholten
Maxime Hedou*
Thibault Rambert*
Mariella Vieli

Cellulose products
Dr. Arpa Gosh*
Justine Charmillot

*Hired by either EPFL or HEIA
Unfair advantage

Unfair advantage


C-C linkage

β-O-4 linkage

Aromatic group

Hydrogenolysis

>200°C, organic solvent

2-5% monomer yield
Unfair advantage


C-C linkage

$\beta$-O-4 linkage

Aromatic group

Unfair advantage

Hydrogenolysis

$>200^\circ C$, organic solvent

2-5% monomer yield

10x increase in yield

20-50% monomer yield
Unfair advantage for applications

Aldehyde-Assisted Lignocellulose Fractionation Provides Unique Lignin Oligomers for the Design of Tunable Polyurethane Bioresin

Richard Vendamme,* Jean Behagel de Buuren, Jaime Gracia-Vittoria, Florence Isnard, Mikael Monga Mukanda, Pablo Ortis, Molan Waibez, Karolien Vanbroekhoven, Chloé Wegmann, Raymond Roers, Florent Hitoqueil, Jeremy S. Luthebacher, and Walter Everaers

Lignin-based biopolymers from sci. literature
44 LPU with 20% non-fractionated Kraft
15 LPU from chemically modified lignin and fatty acids
64 LPU from Kraft lignin and castor oil (20% lignin)
60 Thermoplastic nano-structured lignin elastomers
65 High-elongation & high-strength elastomer (30% lignin)
22 Epoxy resins from fractionated Kraft (38% lignin)

Commercial products (focus adhesives/sealants)

- Polyether-based TPU for injection molding: IROGRAN® A 4851 (Huntsman Corp.)
- Tough and high strength assembly epoxy adhesive: SikaPower®-1200 (Sika AG)
- 2K PU adhesive combining strength and flexibility: SikaForce®-840 (Sika AG)
- Paint shop sealant based on flexibilized epoxy resin: SikaPower®-4508 (Sika AG)
- 2K PU with high elasticity for structural bonding: SikaForce®-7550 (Sika AG)
- 2K silicone UV resistant insulating glass sealant: Sikasil®-IG25 (Sika AG)
- 1K PU elastic adhesive for flooring applications: SikaBond®-T8 (Sika AG)
Unfair advantage

PAX - a new family of renewable polymers

Properties
- Excellent mechanical properties
- Good barrier properties (better than PLA, PHB & PBS)
- Transparent
- Chemically recyclable & (bio)degradable
- Compatible with existing production facilities
Potential of lignin monomers

Sweet spot
Production cost vs functionality