AkzoNobel

sustainabable chemistry for the coatings world

Andre van Linden – Director Scientific Academic Partnerships

A startup in Groningen 1792

AkzoNobel

@focusgroningen


1947
SIKKENS
LAKKEN

Sassenheim: Production and R&D

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Pushing boundaries in the paints and coatings industry

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With our company purpose – People. Planet. Paint. – front and center, innovation is the spark that ignites our ability to advance our products, services and technologies while benefitting our customers and the world around us.

Innovation in numbers

3,000 scientists worldwide

€1.25 bln spent on R&D (last five years)

3,000+ patents

100+ R&D locations worldwide

Our approach to sustainable business

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Focus areas

Climate change

Circularity

Health and well-being

Our key sustainability ambitions by 2030

50%
less carbon emissions in our own operations and across value chain*

100%
circular use of materials in own operations driven by reduce, reuse, recycle

>50%
of revenue from sustainable solutions

>100,000
members of local communities empowered with new skills

SUSTAINABLE DEVELOPMENT GOALS

*baseline 2018

Paints and coatings industry has a direct impact on carbon emissions

Four action areas for carbon reduction

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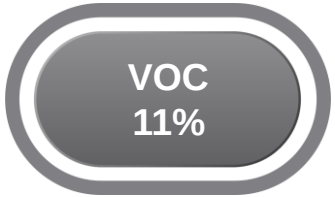
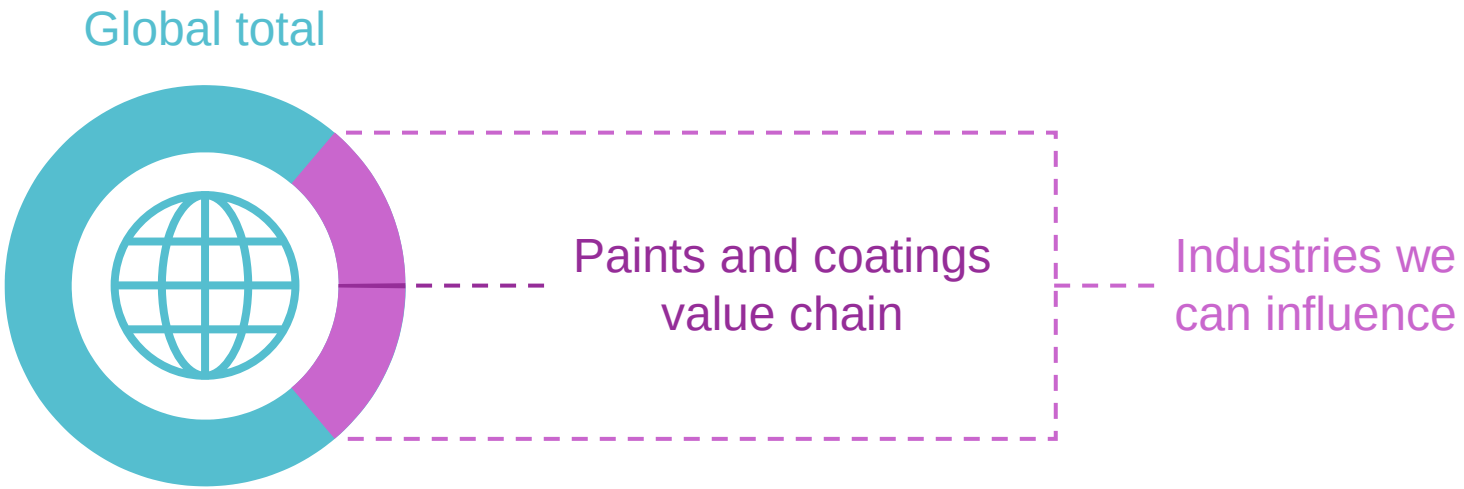
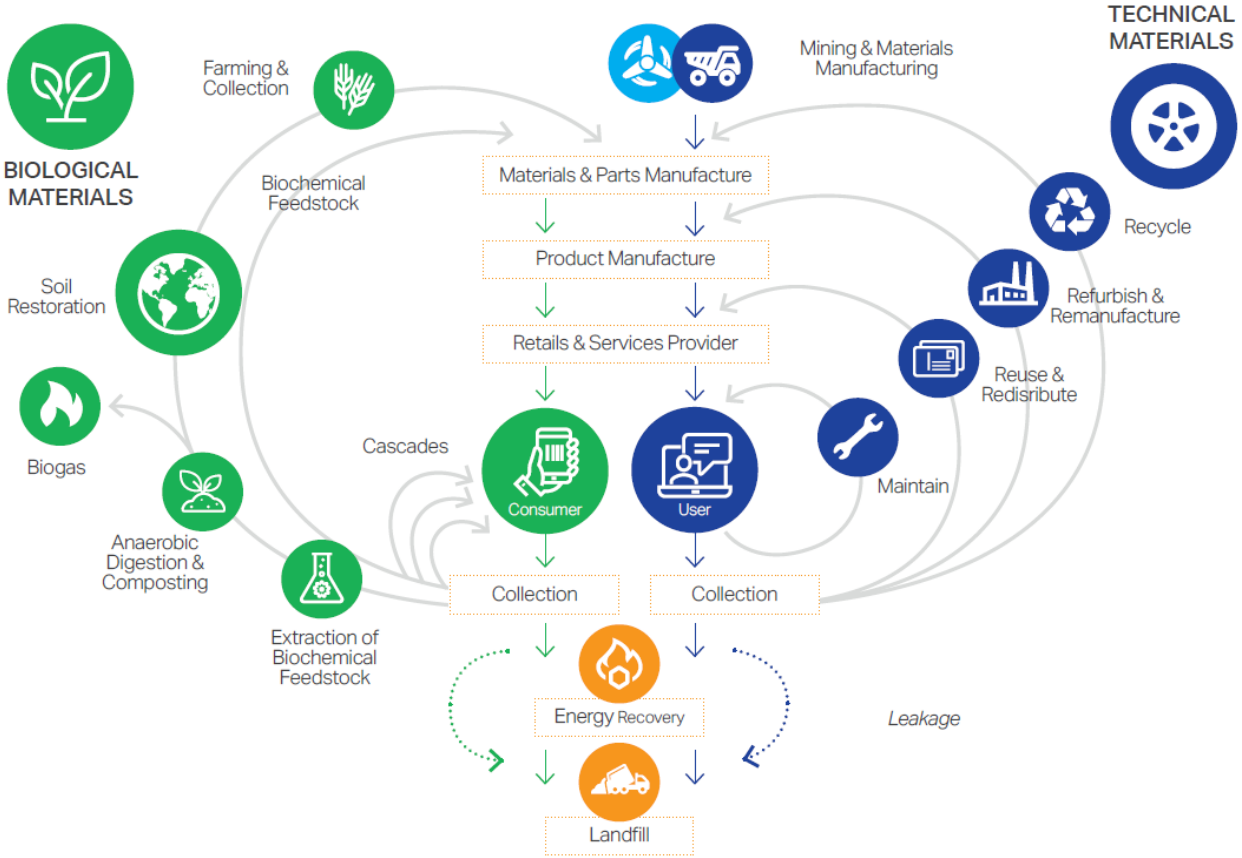
Circular solutions
Reduce solvent emissions
Energy transition
Process efficiency



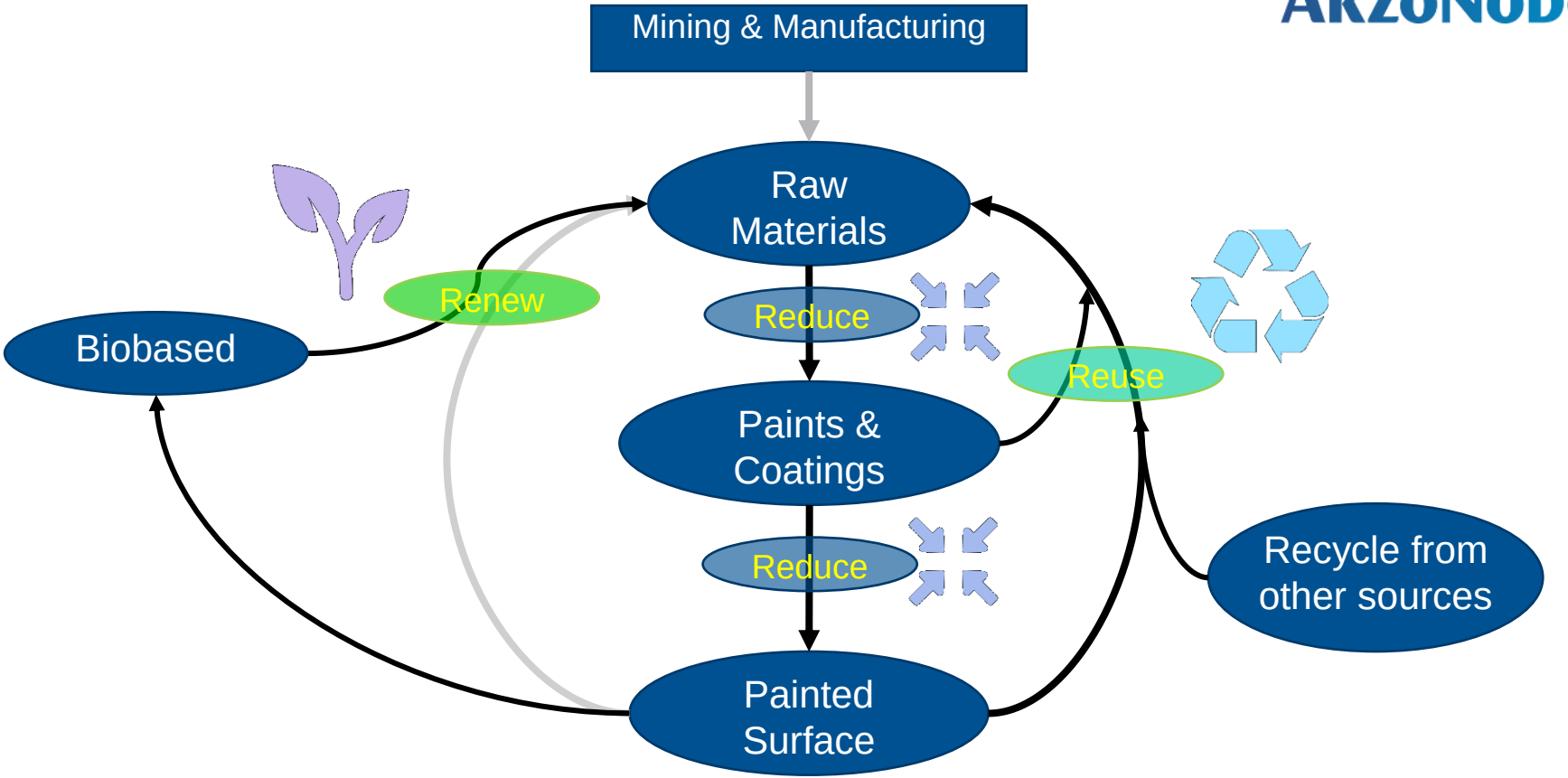
Together, our impact goes beyond paints and coatings

We play a significant role in reducing the carbon footprint of other industries.





*Adapted from EMF https://www.ellenmacarthurfoundation.org/


Mining & Manufacturing
Raw Materials
Renew
Biobased
Reduce
Reuse
Paints & Coatings
Reduce
Recycle from other sources
Painted Surface

Sustainability: “triple R”
Re-duce, Re-use and Re-new

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	Today	Soon	Later
	SB to WB, Low Bake Lower VOC Less SVHC	Long service life Doing more with less	No carbon emission from paint
	Paint waste recycling Recycled packaging	Recycled raw materials	Recycle paint and substrate Triggered release Biodegradable coating
	Alkyds Low% bio binders Mass balance	>50% bio binders ^{14}C bio-based	Full bio binders Bio-based colors

Crosslinking in waterborne coatings with new building blocks

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Advanced Research Center Chemical Building Blocks Consortium

Bio-sourced building blocks

CHITIN

LIGNIN

HUMINS

Carbon oligomer building blocks

Functionality added

HYDROPHOBICITY

CROSS-LINKING HANDLES

PARTICLE-STABILIZED EMULSIONS

COALESCENCE CONTROL

Sustainable building blocks for coatings

Sustainable coating polymers

GREEN DRYING CATALYST

DURABLE FILM PROPERTIES

GREEN FOOTPRINT PRODUCTS

Coating products of the future

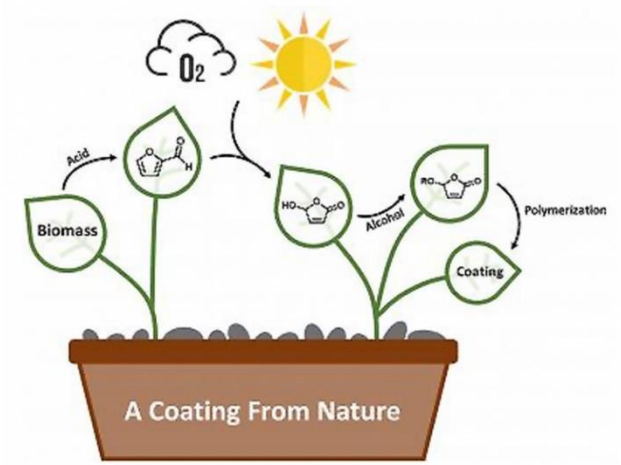
Advanced Research Center Chemical Building Blocks Consortium

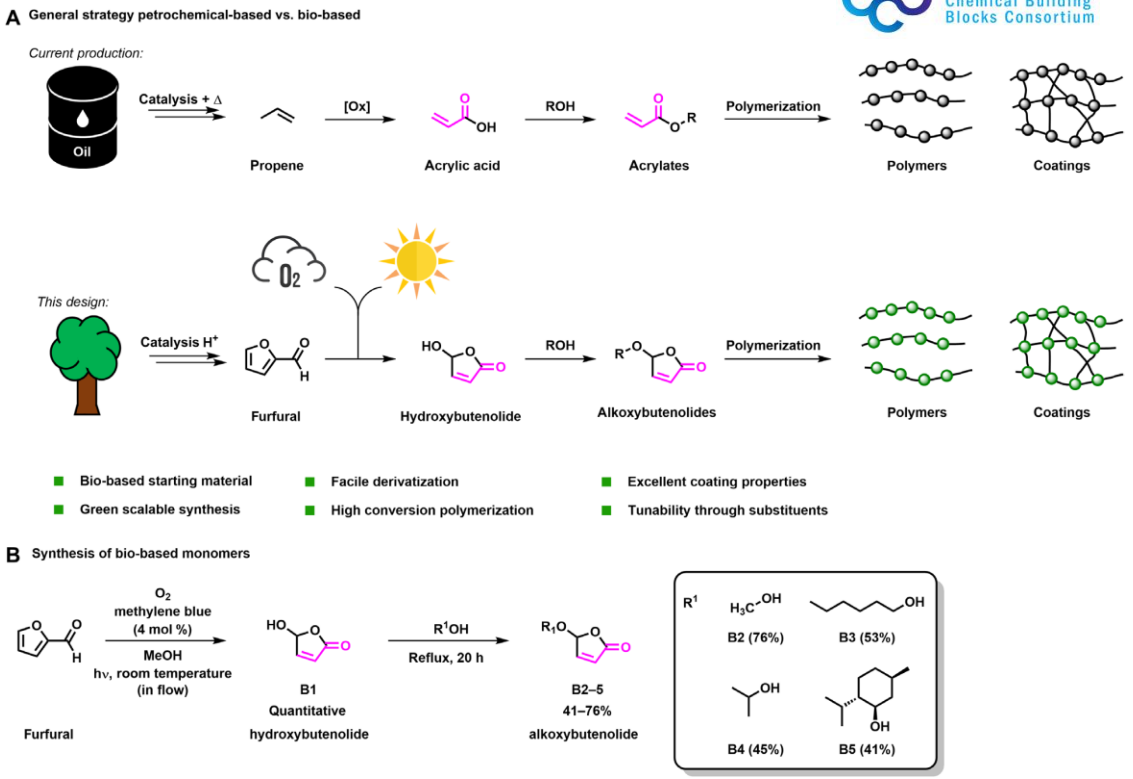
ARC-CBBC: Biobased raw material

Johannes G. H. Hermens, Thomas Freese, Keimpe J. van den Berg, Rogier van Gemert, Ben L. Feringa

New way to produce reactive biobased materials from furfural towards butanolide

- By using light and a bit of heat.
- Upscaling in flow process.



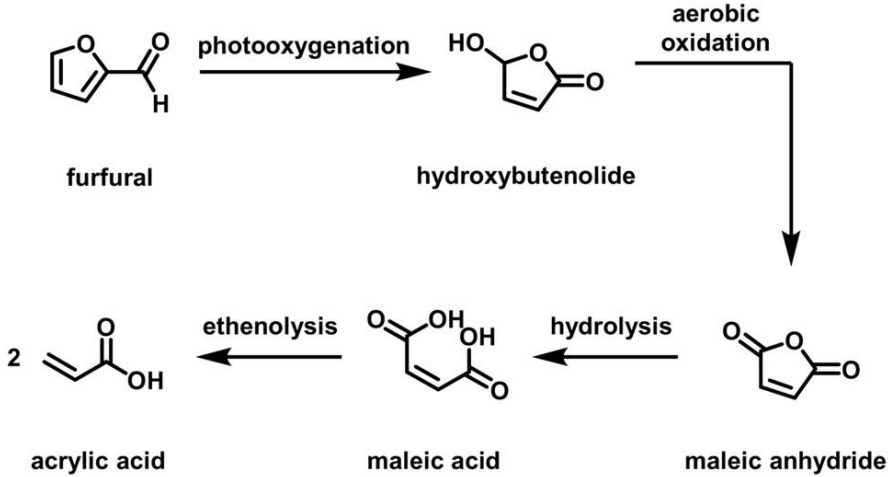


Efficient biobased synthesis of Acrylic acid

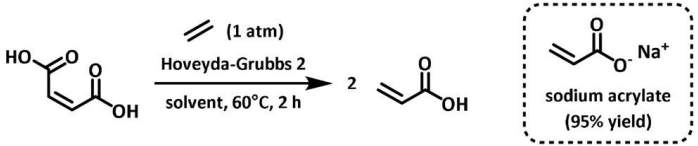
Johannes G. H. Hermens, Andries Jensma and Ben L. Feringa

- Using the butenolide from earlier article
- Upscaling of butenolide process is running

- Building blocks for waterborne coatings
- Novel synthetic route
  - Atom economy
  - Design for energy efficiency
  - Safer solvents and auxilaries
  - Use of renewable feedstocks



- 81% Yield over 4 steps
- Aerobic oxidations
- Mild reaction conditions
- High atom efficiency



- Angew. Chem. Int. Ed. 2022, 61, e202112618
https://doi.org/10.1002/anie.202112618

Collaborative consortia
Return on investment

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- New and patented inventions (biobased building blocks, catalysts)
- Guidelines and insights for developments, engagements for own employees
- Independent proof for our own inventions
- Access to latest and leading-edge characterization techniques (AFM, 3D Microscopes, TEM, SEM, Synchrotron, etc.)
- Relative high leverage from sponsoring (often in-kind for companies)
- Support People.Planet.Paint. with stories and proof points.
- PR articles on Multi-Media and conferences
- High-level exposure (Dutch government, Coatings community)
- Access to Talent Pool, presence at conferences
- Direct link to customers
- Find out what is interesting our suppliers, so know what they are developing

Collaborative consortia

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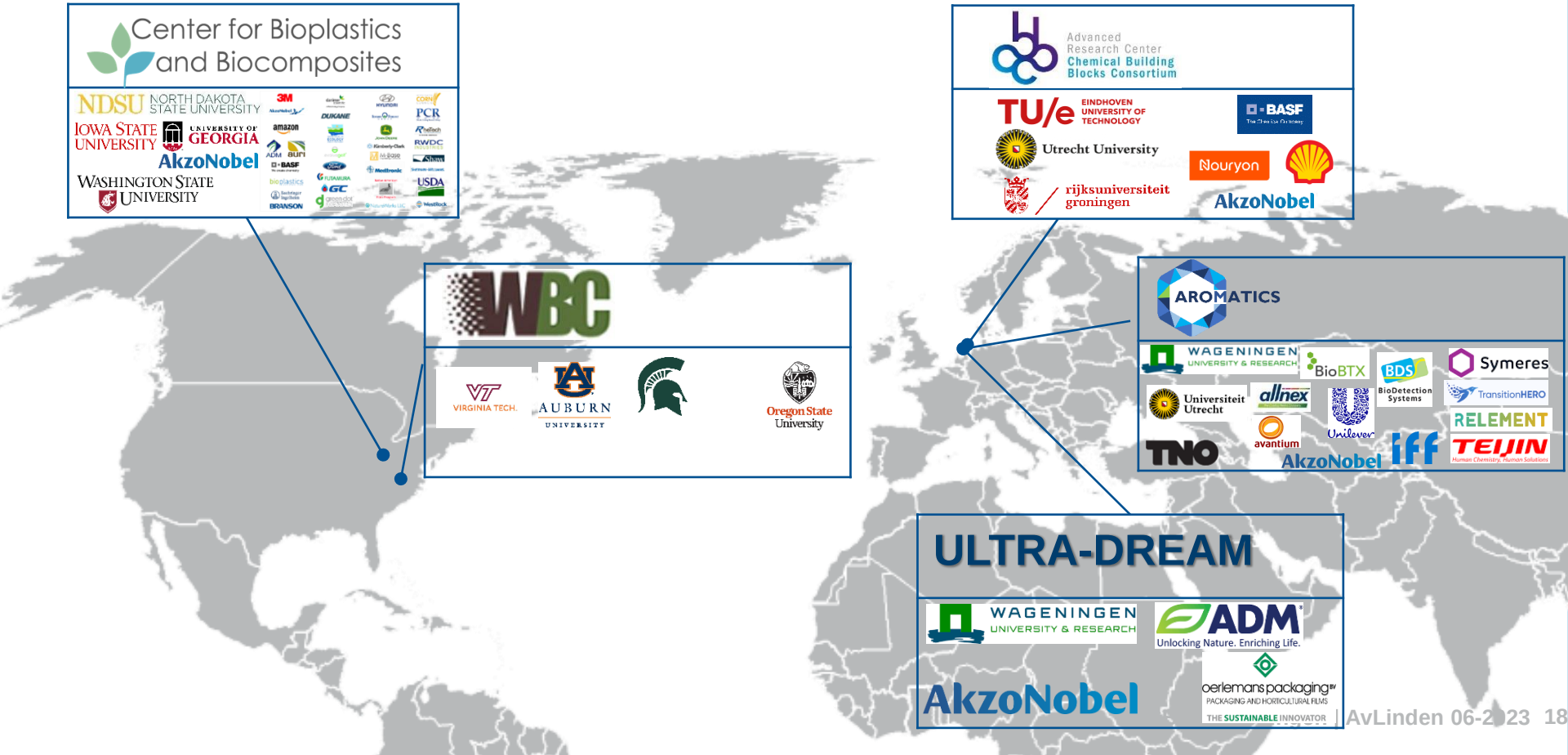

Collaborative consortia

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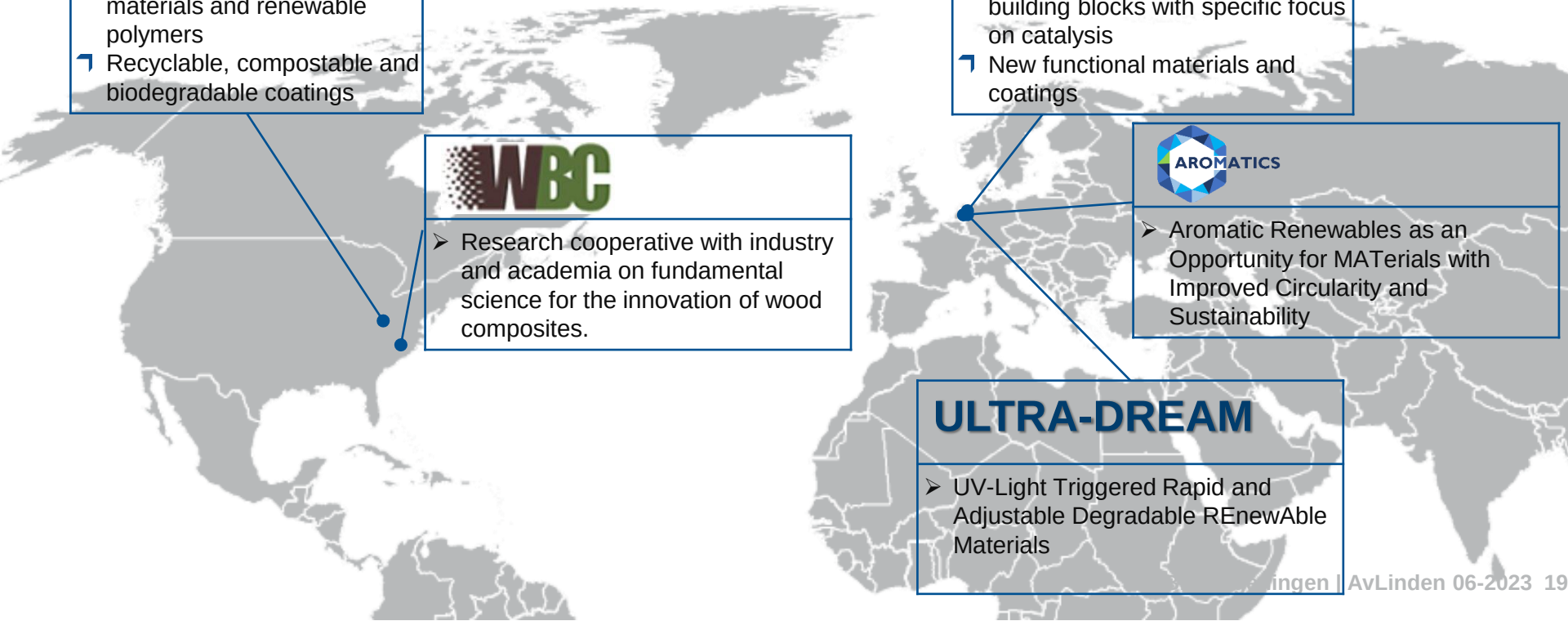


Center for Bioplastics and Biocomposites

- High-value bio-based raw materials and renewable polymers
- Recyclable, compostable and biodegradable coatings

WBC

- Research cooperative with industry and academia on fundamental science for the innovation of wood composites.

Advanced Research Center Chemical Building Blocks Consortium

- New and sustainable chemical building blocks with specific focus on catalysis
- New functional materials and coatings

AROMATICS

- Aromatic Renewables as an Opportunity for MATerials with Improved Circularity and Sustainability

ULTRA-DREAM

- UV-Light Triggered Rapid and Adjustable Degradable REnewAble Materials

ARC CBBC

Key Features
- Collaboration with top researchers from Dutch universities
- Involvement of multiple companies, universities, and government
- Special program dedicated to coatings and materials
- Access to talent pool

Customer Benefits
- Improvement of products
- Better, quicker, more thorough

Bila and Mula programs
- Cobalt free curing
- Novel and efficient catalysts
- Bio-based coatings
- Epoxy catalysts
- Styrene free vinylester-ene curing.

Crosslinking in waterborne coatings with new building blocks
- Bio-based Building Blocks
- New Cross-Linking mechanisms
- Film-Formation from WB paints
- Advanced Spectroscopy on paints and coatings
- Air-cleaning technology

Smart coatings
- Responsive coatings
- Structural coatings

university of groningen
TU/e Technische Universiteit Eindhoven University of Technology
University of Amsterdam
Universiteit Utrecht
University of Twente.
WAGENINGEN UNIVERSITY & RESEARCH
NWO
Advanced Research Center Chemical Building Blocks Consortium
Nouryon
BASF The Chemical Company
AkzoNobel

https://arc-cbbc.nl/

The Center for Bioplastics and Biocomposites (CB²)

AkzoNobel

Center for Bioplastics and Biocomposites

Key Features

- Focus is on renewable resources and focuses on developing high-value biobased products from agricultural feedstocks.
- Collaboration with ca 40 partners (e.g. Ford, 3M, Amazon, BASF, Hyundai)
- Several proposals from AkzoNobel accepted and running.

AkzoNobel is involved in several CB2 projects
Lignin-Derived Compounds
Biodegradable Xylan-based Polymer Materials
Bio-based Building Blocks for Durable Coatings .
Plant Oil-based Latex Adhesives
Polymers - Next Generation Packaging Materials
LCA Tool for Sustainable Bio-based Coating Material Design

Customer Benefits

- Improves customer carbon footprint

Iowa State University · NDSU North Dakota State University · NSF · University of Georgia · Washington State University

https://www.ndsu.edu/centers/cb2/index.html

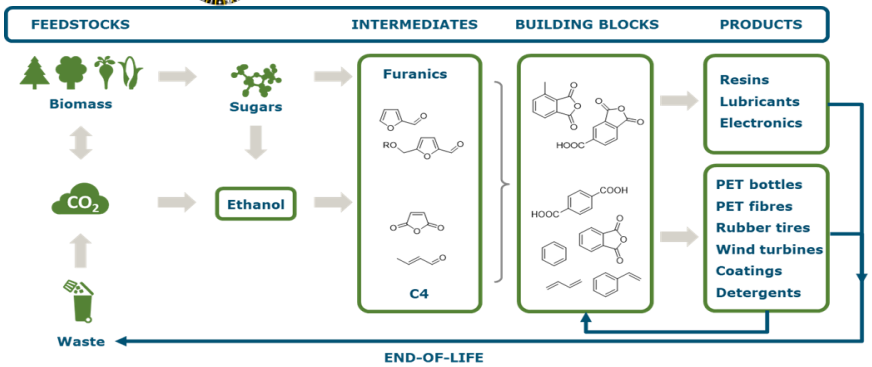
MOOI / Aromatics

Key Features

- **A**romatic **R**enewables as an **O**pportunity for **MAT**erials with **I**mproved **C**ircularity and **S**ustainability
- April ‘23 – March ‘26
- Circular or bio-feedstock for bulk and platform chemicals
- Coordinator: WFBR
- 14 different partners

Research Themes

- Demonstrate full carbon circularity
- From TRL 2/3 to TRL 5



Topsector site on Aromatics

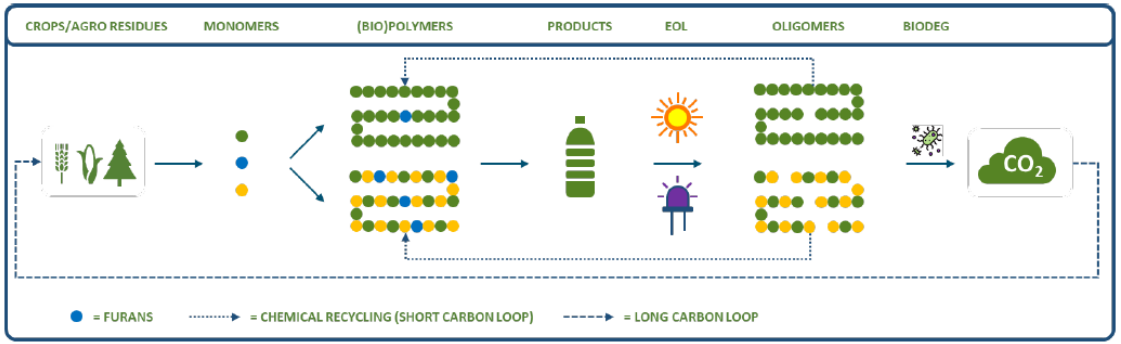
Ultradream

Key Features

- UV-Light Triggered Rapid and Adjustable Degradable REnewAble Materials (ULTRA-DREAM)
- Initiative from Wageningen Food and Biobased Research with Archer Daniels Midland
- PPS starting in 2023
- Spin off from project where FDCA esters are susceptible to UV-irradiation so biobased is possible.

Research Themes

- Use carbohydrate derived monomers
- Create novel biobased polymers
- Testing of Biodegradation and chemical recyclability



WUR site on Ultra-Dream

Conclusions

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Steps are made, but many more need to follow

Biobased is major in transition, but it is a lot of work with potential other effects

Like eating an elephant: bite by bite

New investments in processing needed to reach enough scale

Whole value chain needs to work together (from building block providers to new ways of application)

Clever regulation and support will help!