



Brighter Use of Resources

How alternative building blocks can be used in the plastics industry

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A large offshore oil rig stands in the middle of a blue ocean under a bright blue sky with scattered white clouds. The rig is a complex of steel structures, including several tall derrick towers and a central processing unit. A large crane is visible on the rig's deck. The rig is supported by several legs extending into the water.

CHALLENGE: SAVING OUR FOSSIL RESOURCES

Challenge: Saving our fossil resources

Use of carbon in the most productive way



- Chemical industry is dependent on the element carbon
- Current carbon source: fossil raw materials, such as oil
- 4% – 6% of global output is used for plastics production
- But oil reserves are finite and will be depleted in the long run
- Markets are subject to fluctuations

Exploring alternative feedstocks ...

New products and research and development projects



Biomass

- Bio-based hardeners for car and furniture coatings
- Bio-based aniline for insulation material
- Bio-based resin for stable timber construction materials

CO₂

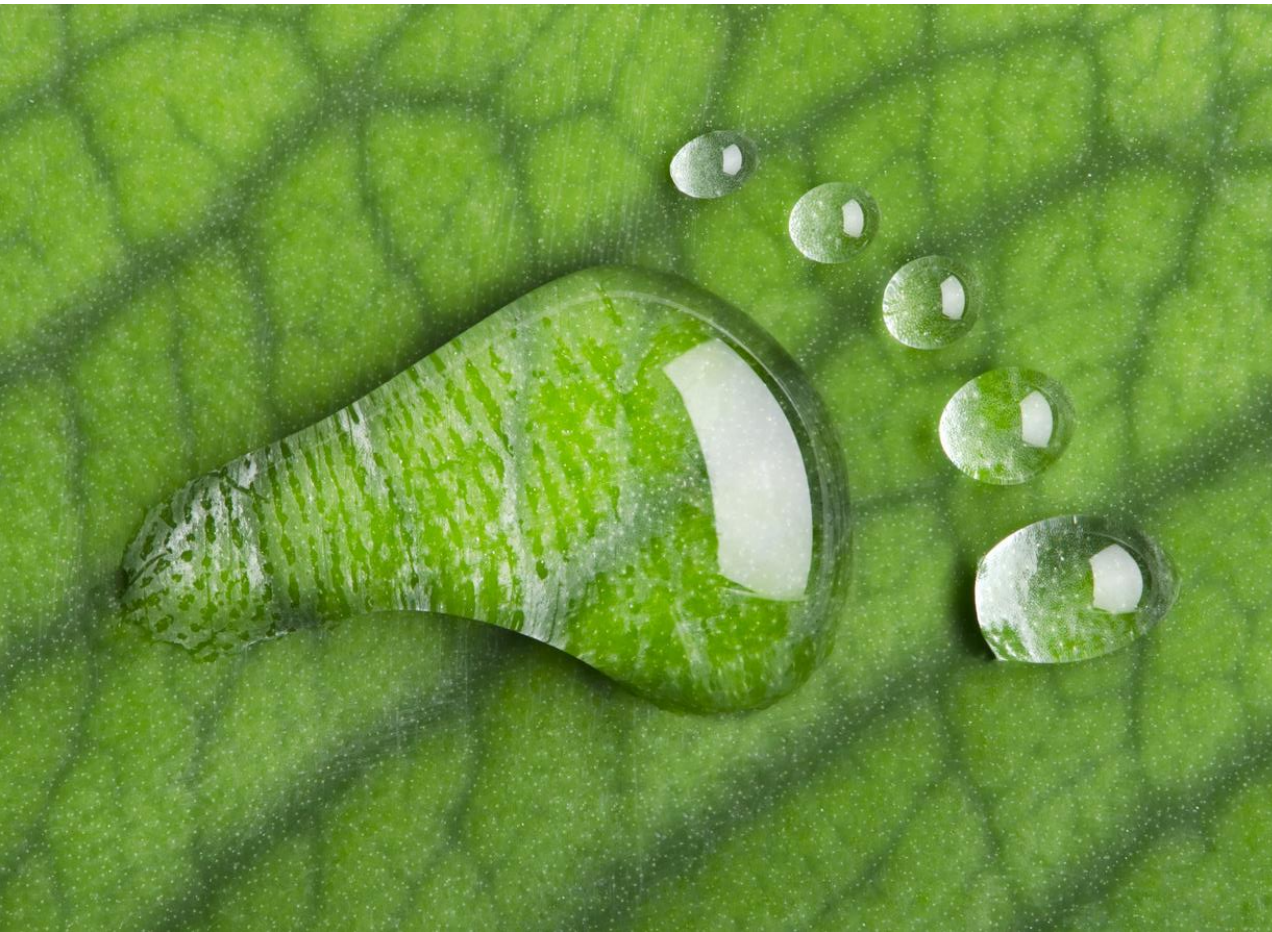
- CO₂-based polyols for mattresses and upholstery (cardyon™)
- CO₂-based polyols for hoses, car seats and insulation material

pFA

- Paraformaldehyde (pFA) based polyols for sporting goods and cables

Impact on sustainability

Conservation of resources



- Contributes to resource efficiency by saving petroleum-based raw materials
- New process fundamentally more environmentally compatible than conventional production
- Carbon footprint reduced compared with conventional product

EXTENDING THE SCOPE FOR CO₂

DREAM RESOURCE PROJECT

A new partner for CO₂

Bringing ethylene oxide into play



- Covestro successfully developed a process to produce polyols on the basis of propylene oxide (PO) and CO₂
- Now a publically funded project is focussing on the reaction of ethylene oxide (EO) and CO₂
- By bringing EO and CO₂ together, polyols for a broader range of applications can be made
- The aim is to substitute up to 20 % of fossil based feedstocks in polyols
- Lab scale process is in development

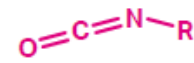
CONVENTIONAL POLYURETHANE (EO)

EO

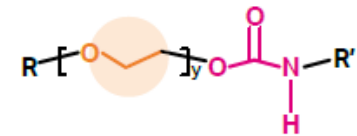
$\xrightarrow{\text{R-OH}}$



+



\longrightarrow



Polyol

+

Isocyanate

\longrightarrow

Polyurethane

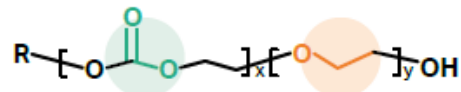
CO₂ BASED POLYURETHANE (EO)

EO

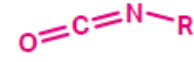
+

CO₂

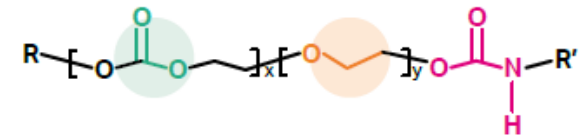
$\xrightarrow{\text{R-OH}}$



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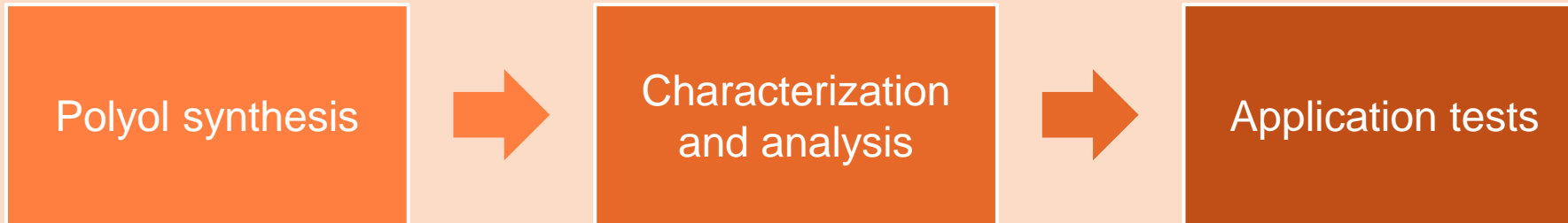


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Bringing competencies together

Academia and industry join forces – project Dream Resource

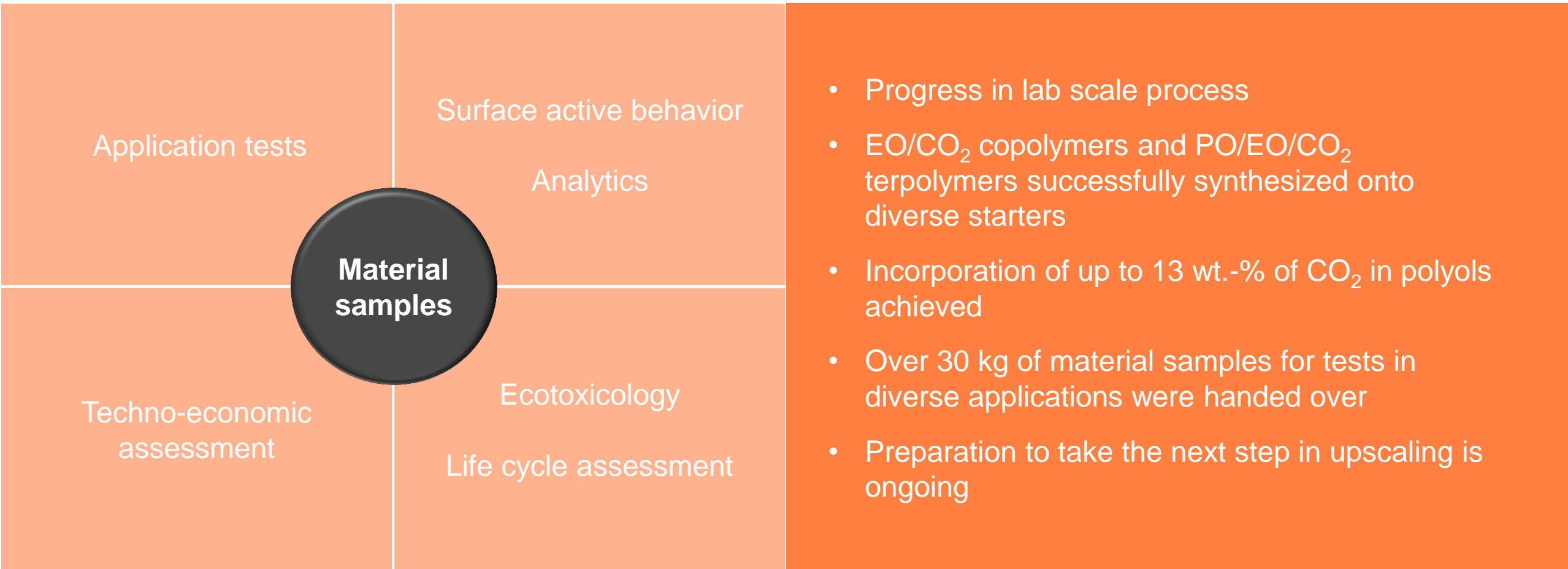


Kick-off September 1st, 2016



Work in progress

Mid-term achievements

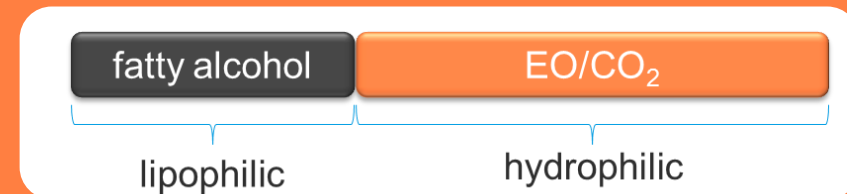


Driving, cooling, cleaning with CO₂

Different applications are conceivable



- Combination of the novel EO/CO₂ polyols with isocyanates yield polyurethanes for rigid or molded foams
 - Application in car seats and insulation boards possible
- Furthermore the EO/CO₂ materials are promising candidates for non-ionic surfactants
 - These can be found e.g. in laundry detergents
 - EO/CO₂ material show enhanced sustainability



Pushing boundaries further

Striving for a broader raw material base



Our vision

- Use alternative building blocks in as many different types of plastics as possible
- Replace as much fossil raw material as possible with alternative building blocks

The right way

- to broaden the plastic industry's raw material base
- to promote circular economy



THANK YOU

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