Adding Value to Speciality Chemicals with Biobased Resources

NEPIC International Bioresources Conference
September 2016

David Freeman

CRODA

Adding Value to Speciality Chemicals with Biobased Resources

- Croda Introduction
- Croda & Sustainability
  - Sustainable Product Design
- Adding Value to Naturally Derived Materials
  - Biobased Innovation Examples

Who We Are

We are the name behind the high performance ingredients and technologies in some of the biggest, most successful brands in the world: developing, making and supplying specialty chemicals that are relied on by industries and consumers everywhere.

Our Business Model

Engage

We work in close partnership with customers and develop emerging technologies around the world

Create

We design innovative ingredients that enhance everyday products

Make

We manufacture to consistently high standards across the world

Sell

We generate revenue by selling our ingredients directly to customers

Markets We Serve

Personal Care

- Personal Care

Life Sciences

- Health Care
- Crop Care

Industrial Chemicals

- Industrial Chemicals

Performance Technologies

- Coatings and Polymers
- Geo Technologies
- Home Care
- Lubricants
- Polymer Additives

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Our Highlights 2015

FTSE4Good
Since 2008

CDP CLIMATE DISCLOSURE LEADER 2013
Since 2013

2013 CSR Rating GOLD ecovadis
Since 2013

NATURAL CAPITAL DECOUPLING LEADER 2014
Awarded 2014

BRITAIN'S MOST ADMIRED COMPANIES 2014/15 WINNER MT

£1,081.7m

Revenue in 2015 with 26.1% of sales from NPP

24.2%

Energy from non-fossil fuel

↓56.8%

Reduction in waste to landfill since 2010

Eleven

manufacturing sites have RSPO certification to support CSPO

66.1 %

raw materials from renewable sources

6,321 hours

1% Club volunteering hours, equivalent to c.£120,000

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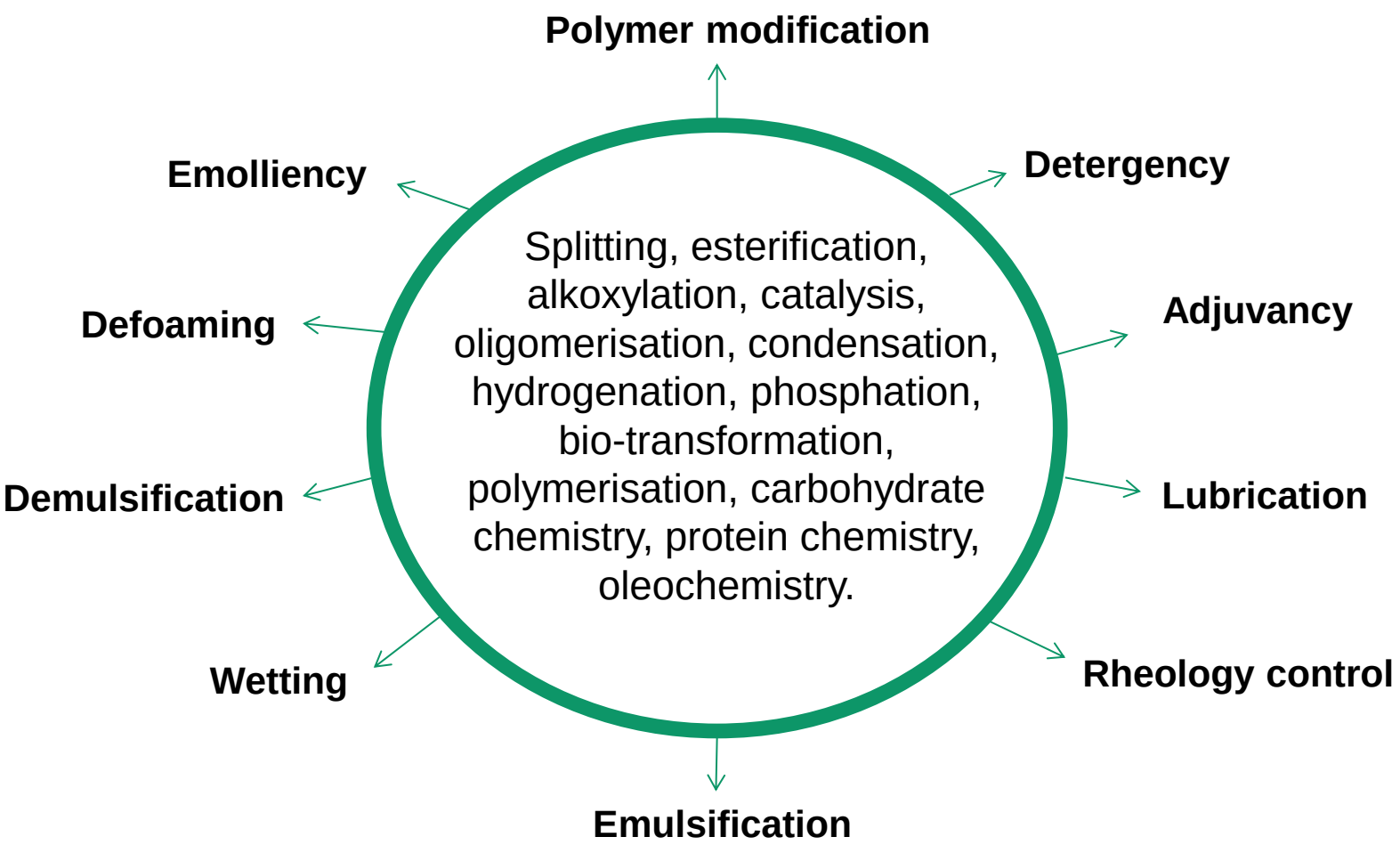
Our Capabilities



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Our Sustainability Journey

1925 

Croda was founded with the product Lanolin, which is obtained by refining the natural grease from sheep's wool, making it a very natural and sustainable product

2007 

Focus on our sustainability journey began when we produced our first CSR Report and launched the Four Pillars

2008 

We produced our first annual GRI Report (Global Reporting Initiative), an internationally recognised reporting framework against sustainability performance

2011 

We rebranded our report to the "Sustainability Report" and established our Materiality Matrix identifying what matters most to us. These were split into Material Areas and Material Issues

Today 

We have restructured our Sustainability Programme into 10 Material Areas aligned with the Global Drivers of Change. We have improved our reporting capabilities by aligning with GRI G4 and responding to the full suite of CDP programmes.

Our 10 Material Areas

Environmental Impact

Product Stewardship

Product Design

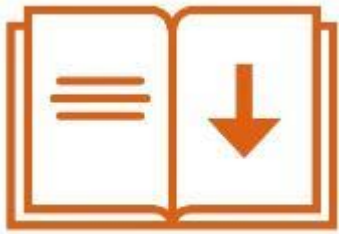
Quality Assurance

Process Safety

Occupational Health & Safety

Our People

Diversity & Inclusion



Corporate Knowledge

Community Education & Involvement

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Product Design

Deliver the most innovative and sustainable ingredients to our customers

- Product Design in Croda is wholly focussed on delivering new or improved ingredients to meet customers' desired effects
- Intrinsic to Croda's value in many markets since 1925
  - >66% of our raw materials are renewable
- Initial focus in 2007 focussed on measuring New Product Developments against 12 Principles of Green Chemistry
- P. T. Anastas and J. C. Warner, *Green Chemistry ; Theory and Practice*, Oxford University Press, Oxford, 1998

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Product Design

Deliver the most innovative and sustainable ingredients to our customers

1. Waste prevention rather than treat or clean-up.
2. Atom economy
3. Less hazardous chemical synthesis
4. Design safer less/non-toxic chemical products
5. Safer solvents (or no solvents) & auxiliaries
6. Energy efficient
7. Renewable feedstocks
8. Reduce derivatisation / number of steps
9. Catalysis
10. Design for degradation
11. Real-time analysis for pollution prevention
12. Inherently safer chemistry for accident prevention

12 Principles of Green Chemistry

Anastas & Warner

Sustainable Product Design

- Product Design
  - Optimise against 12 principles of green chemistry
- Percentage Renewable Raw Materials, such as
  - Oleochemicals / Fatty acids
  - Wool grease
  - Sugar chemistry
  - Bio-polymers
  - Botanical Extracts
  - Bio Ethylene Oxide (from 2017 H2 onwards)
  - New chemistries from our suppliers
- Sustainability Benefits in use:
  - Reducing energy/ resource usage
  - Minimising environmental impact of technology
  - Improving service life
  - Helping customers meet environmental regulations

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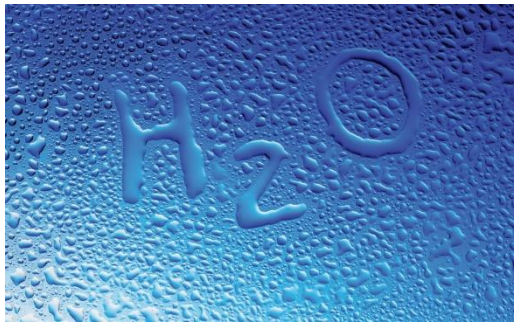
Future Considerations?

- Further Engagement of Customers to Understand their needs from a Sustainability Perspective.
- Further Understanding of the Influence of the Paris Protocol.
- Further Measurement of the Impact of Croda products.



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Technology Differentiation in Croda

- What is Croda all about?
- From a technology perspective

"Adding Value to Naturally Derived Raw Materials by Purification, Separation and Derivatisation"

Using Woolgrease

Medilan™

Further refining

Lanolin

Derivatise

Solan

Refine

Woolgrease

Separate

Vitamin D 3

Cholesterol

Wool wax alcohols

Fatty Acids

Separate

18-MEA

Derivatise

Esters, Alkoxylates

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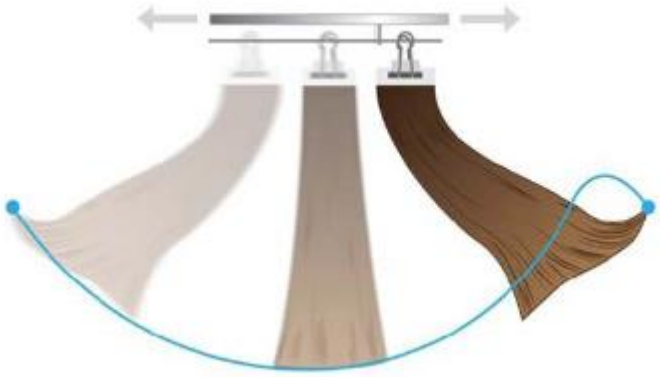
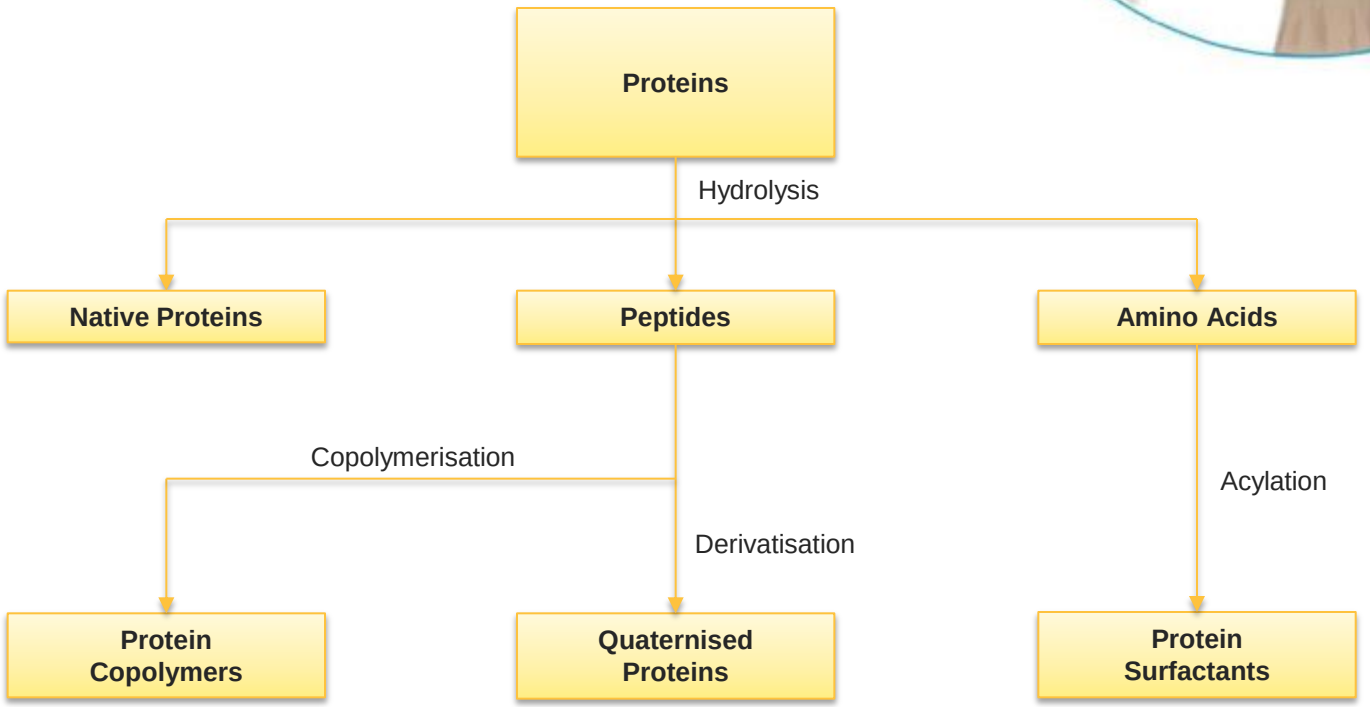
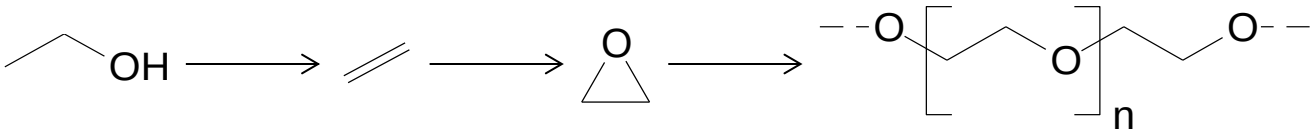
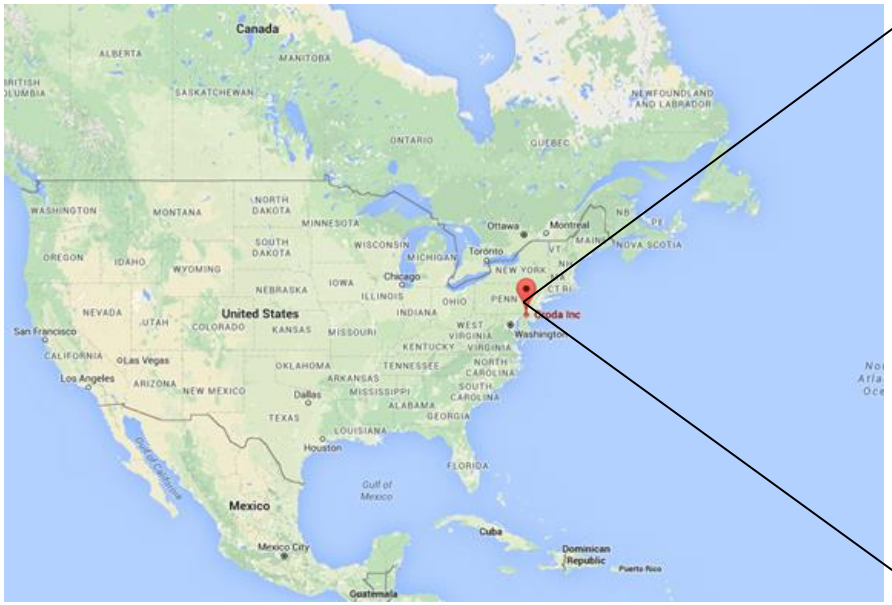
Using Proteins





Ethylene Oxide from Bio-ethanol





Using Vegetable Oil

Natural oils & fats

Water

Splitting & refining

Fatty acid

Glycerine

Hydrogenation

Amidation

Polymerisation

Esterification

Saponification

Amides

Isostearic acid

Dimer acids & trimer acids

Esters

Soaps

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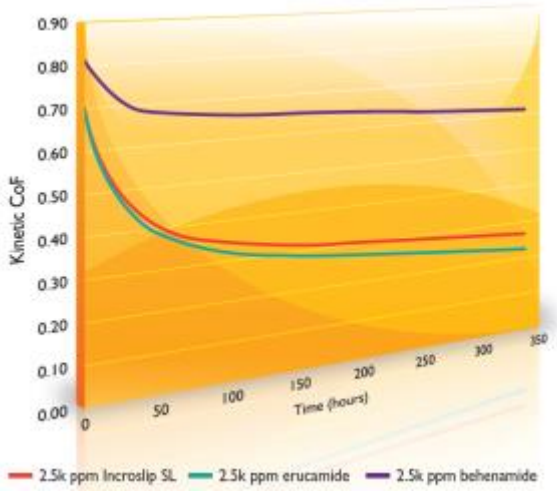
Biobased Innovations – Incroslip SL

- New slip agent for polyolefins
- Properties
  - High slip performance
  - Lower visible bloom
  - Oxidative stability
  - Scratch resistance
  - Food contact compliant
  - 88% biobased



PP homopolymer cast film - 50 µm film
all contain 2000 ppm synthetic silica

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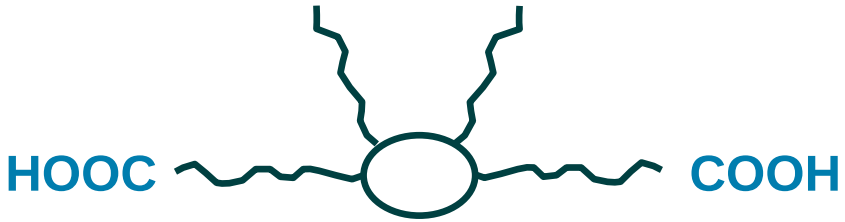
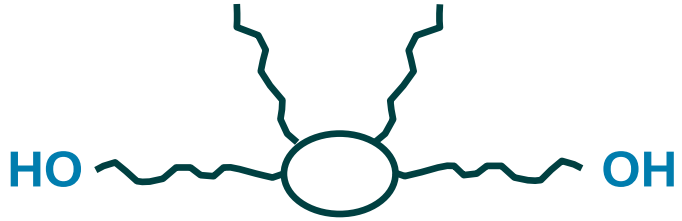
Different forms of Dimer technology

Renewable, Hydrophobic

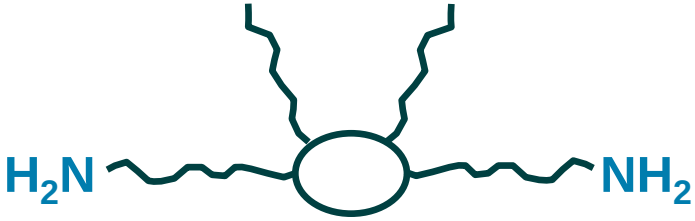
Dimer acid
PRIPOL



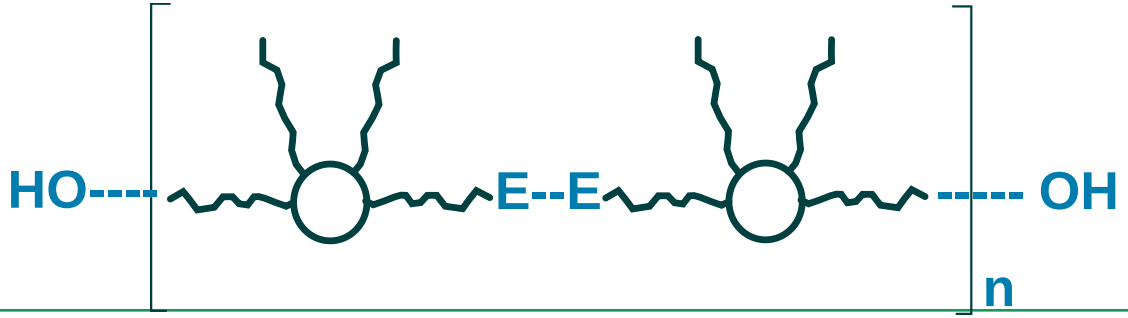
Dimer diol
PRIPOL



Dimer diamine
PRIAMINE



Polyester polyols based on dimer
PRIPLAST



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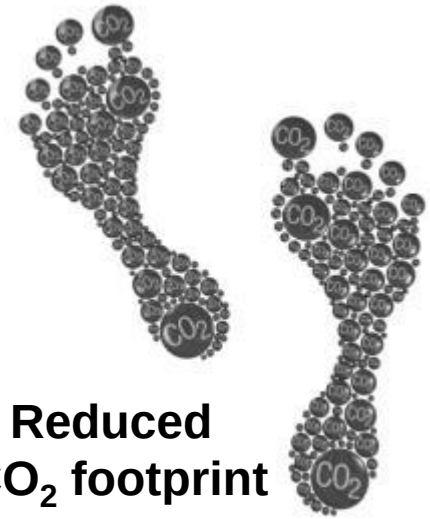
Dimer Fatty Acid Value Propositions



Reduced CO_2 footprint

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Using Vegetable Oil

Natural oils & fats

Water

Splitting & refining

Fatty acid

Glycerine

Hydrogenation

Amidation

Polymerisation

Esterification

Saponification

Amides

Isostearic acid

Dimer acids & trimer acids

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Soaps

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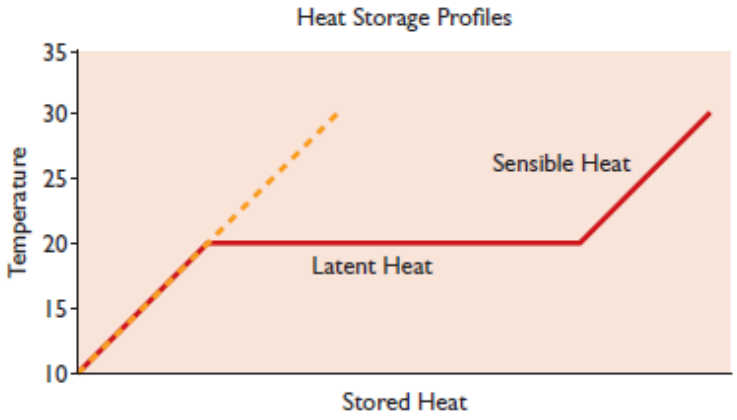
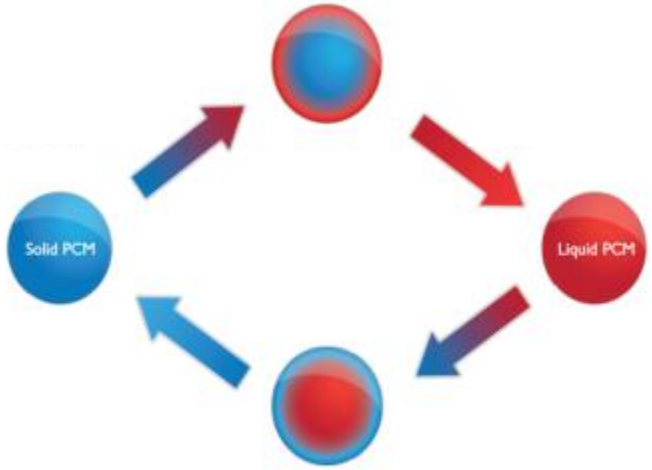
Biobased Innovations - CrodaTherm

- Phase Change Materials





- Biobased, safe and stable
- High effectiveness
- Cold - Ambient - High temperatures
- Packaging, HVAC, Textiles, electronics, heat storage.

CRODATHERM
Bio-Based Phase Change Material

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Summary

- Bioresources have a growing role to play in Innovation.
- Customer needs must remain core to this.
- Paris Protocol may help drive activity.
- New Process Technologies & Raw materials will likely be required.

Areas of Interest for Collaboration

- Unmet Technical Needs.
- Novel Raw Materials / Processes.
- New Technologies for or Approaches to Green Chemistry.

Thank You for Your Attention

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