Models for Advancing Green Chemistry Innovation: Collaborative Innovation, Open Innovation, Incubators, and Accelerators

Moderator: Monica Becker, GC3

Presenters:

Greg Stillman, Ventures
Fashion for Good-Plug and Play

Frank Tropper, Sr. Director-Global Programs
NineSigma

Han Bevinakatti, Principal Scientist, Global R&D
Nouryon

GC3 Collaborative Innovation Program

Goal: To advance R&D, commercialization, scaling and adoption of green chemistry technologies

Major Strategies:

- Create opportunities for companies to collaborate to meet their common technology needs.
- Engage the entire value chain: Chemical manufacturers, brand-owners, retailers and other stakeholders.
- Strategically connect innovators to development and commercialization partners.

Criteria for Developing & Selecting Green Chemistry Technologies

	GENERAL CRITERIA (For Personal Care, Household, and Natural/Organic Products)	ADDITIONAL WANTS
1. Performance		
Activity	Broad spectrum activity: gram-positive & gram-negative bacteria, yeast & mold	Not likely to build microbial resi
	In formulation, at use levels, meets preservative challenge test acceptance criteria (e.g., USP 51, CTFA M-3, or similar)	
	Low number of ingredients needed to get broad spectrum activity (ideally 1 - 3 ingredients)	
pH Activity	pH 5 – 8	pH 5 – 10, best is pH 2 – 11
Shelf Life in Formulated Product	Shelf life of 2 years	Shelf life of 3 years
	Can withstand freeze/thaw	Stable from 25 to 50°C
		UV stable for 3 months in packa

Articulates the need for new preservatives

Provides a set of detailed development criteria for new preservatives, including:

- Performance
- Regulatory
- Human health
- Environment
- Business factors

https://greenchemistryandcommerce.org/documents/GC3PreservatvesCriteria1.pdf

Collaborative Challenges to Search for and Commercialize Novel Technologies


FOLLOW US:

GLOBAL COSMETIC INDUSTRY®
INNOVATIONS THAT DRIVE BRANDS

Search Our Site

Business > R&D > Claims Ingredients Regulatory Technology

The Green Chemistry & Commerce Council Holds Competition for New Preservatives

May 9, 2017 | Contact Author

7 Awards from a $175,000 prize pool

Now: Joint development work between innovators, suppliers and brand owners

Sponsors & Participants

CPG Companies

- Babyganics
- Beautycounter
- Beiersdorf
- Colgate-Palmolive
- Johnson & Johnson
- Kao USA
- Method
- P&G
- RB
- SC Johnson
- Unilever

Retailers

- Target
- Walmart

Preservative Suppliers

- Dow
- Lonza
- Schuelke
- Symrise
- Thor

Other Stakeholders

- Environmental Defense Fund
- Minnesota Green Chemistry

GC3 Startup Network

Members of the GC3 Startup Network, include:

Akron Ascent Innovations

Akron Ascent Innovations has developed a new adhesive technology platform offering a unique combination of high strength, excellent removability and reusability on a wide range of surfaces. The nanofiber-based dry adhesive offers a number of sustainable advantages compared to conventional adhesives for the consumer market, as well as industrial, electronic, and medical sectors.

www.akronascent.com

Checkerspot Inc.

As a design-centric materials company, Checkerspot's applications development capability brings-to-life performance materials created through biology and chemistry.

www.checkerspot.com

Chinova Bioworks

Chinova Bioworks has developed a natural antimicrobial preservative using a fiber from mushrooms, chitosan. It's a broad-spectrum and clean label.

www.chinovabioworks.com

Colorifix Limited

Colorifix is committed to a more sustainable future for textiles and fashion. By engineering a revolutionary dyeing technology using synthetic biology, Colorifix converts agricultural byproducts into a wide range of colorants for textile dyeing. By removing all harmful chemistry from the process, we dramatically reduce the environmental impact of this highly polluting sector in a cost-effective manner.

www.colorifix.com

Defunkify

Defunkify believes that the toxins all of us put in, on and around our bodies matter. Starting from a clean slate, using the safest ingredients and then testing for performance as well as mixture toxicity, Defunkify makes cleaning products that are both high performance and eco friendly.

www.defunkify.com

Calling all innovators developing green chemicals, materials, products or manufacturing technologies!

4th Annual GC3 Technology Showcase

Sustainable Chemistry Technology Needs from Large Strategics

The GC3 member companies listed below contributed specific chemistry technology areas for which they are actively seeking more sustainable solutions. Submissions are not limited to these categories, but preference may be given.

Apple	HP Inc.	Lowe's	Patagonia
BASF Corporation	Johnson & Johnson	Levi Strauss & Co.	Sherwin-Williams
Beiersdorf AG	Kingfisher PLC	New Balance	Steelcase
Best Buy	L'Oréal USA	Procter & Gamble	Target
Eastman			

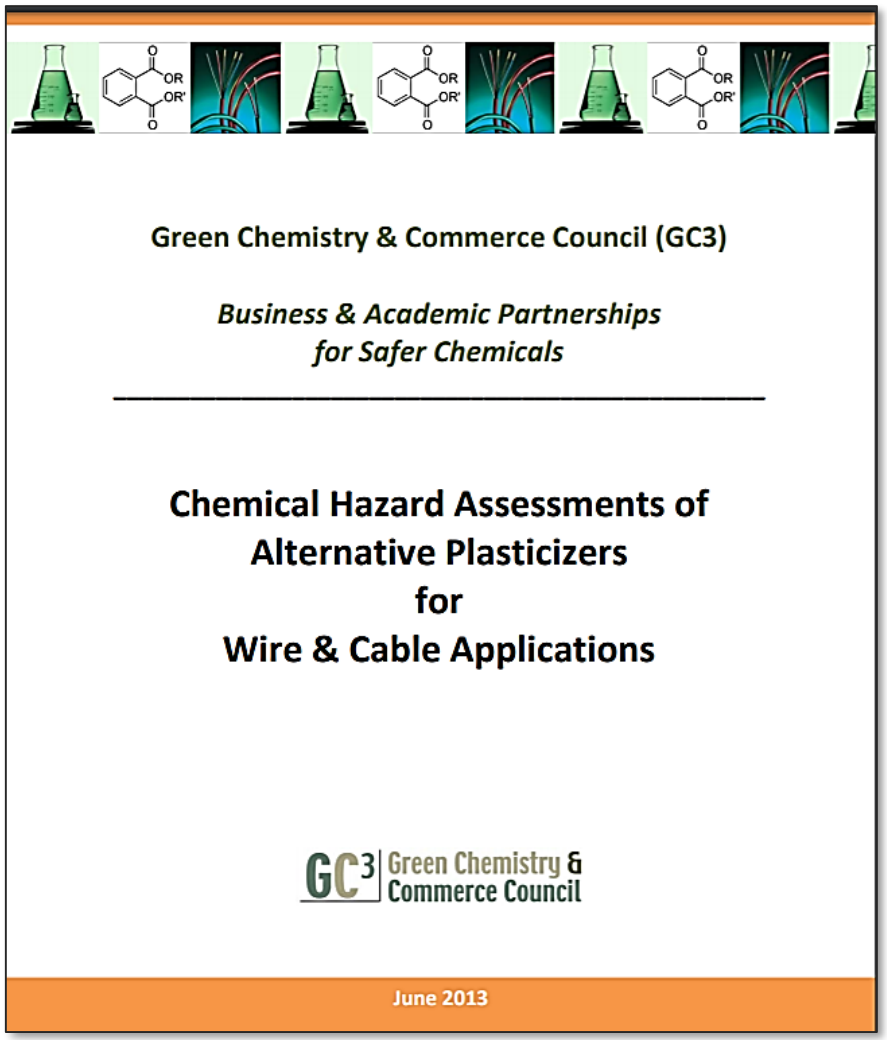
Technology Areas*

Adhesives	Fabric Finishes	Pigments	Recyclable Latex
Battery Technologies	Flame Retardants	Plasticizers	Recycling Technologies
Coating Technologies	Fungicides	Polyurethanes	Solvents
Corrosion Inhibitors	Monomers/Polymers	Raw materials for formulated consumer products (including personal care and household products)	

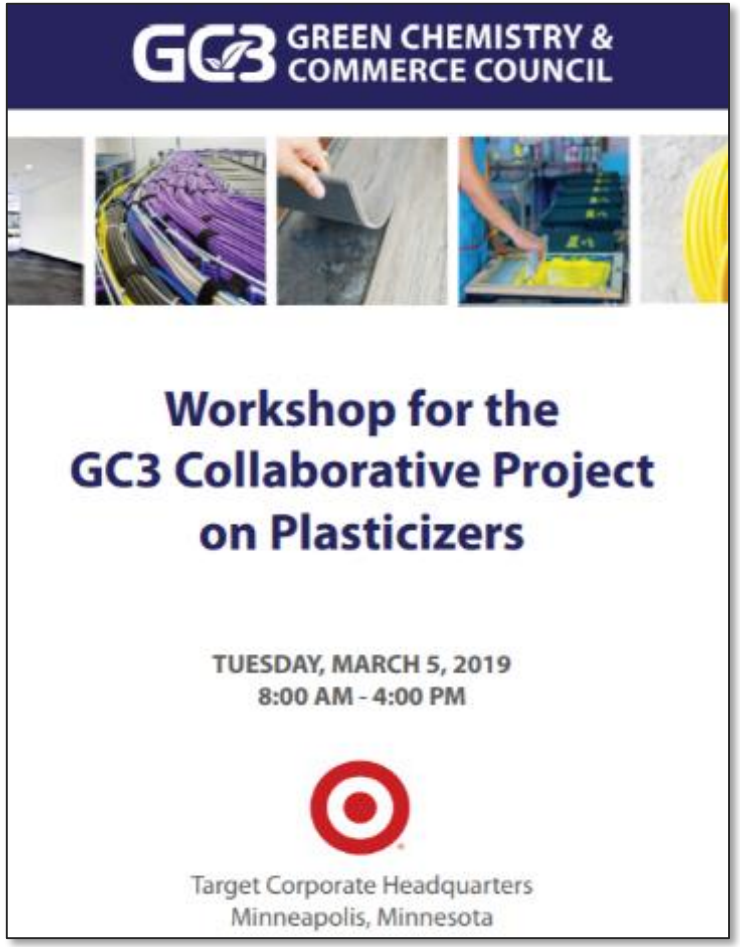
*For a detailed description of the needs identified within each category, click the button below.

Detailed Technology Needs

Collaborative Hazard Assessments of New Chemical Technologies



Value Chain Workshops to Identify Opportunities, Gaps and Needs to Advance Innovation & Adoption



Partnering with GC3 Members on Green Chemistry Innovation Programs

Nouryon Imagine Chemistry Sustainable Chemistry Challenge

2019 Challenge Categories:

1. Sustainable bio-based surfactants for everyone
2. Performance-boosting nanoparticles
3. Sensing in demanding chemical environments
4. Label-free chemistries
5. Pushing the frontiers of chemical innovation

Partners:

High-Tech Gründerfonds
GC3 GREEN CHEMISTRY & COMMERCE COUNCIL
ICOS CAPITAL
luxresearch
S/PARK
StartupDelta
Unilever
Innovate UK Knowledge Transfer Network
enterprise europe network

Criteria for Selecting Topics for Collaborative Projects

1. Human health/environmental drivers
2. Regulatory/market pressure
3. Pre-competitive for product manufacturers/brands
4. Green chemistry innovation and adoption opportunity
5. Alignment with other GC3 efforts, e.g., RLC
6. Opportunity to partner with strategic organizations/leverage additional resources
7. Interest to GC3 members

GC3 Plasticizer Project

Sectors:	Points in the value chain:
Electronics	Chemical manufacturers
Building Products, e.g., Flooring	Compounders/plastic suppliers
Household Products	Brand owners
Apparel & Footwear	Retailers

Initial slate of projects under discussion, inc.:

- Assessment of drivers and gaps for specific products/sectors to identify high-potential areas for progress on plasticizers
- Collaborative development of “choice criteria” for plasticizers
- Develop a set of best practices to ensure safer plasticizers are designed into new products

Current Participants

3M
BASF
Best Buy
Construction Specialties
Eastman Chemical
Emerald Kalama
ExxonMobil
Dell, Galata
HP
Kingfisher
Mexichem
Mohawk
Nike
Shaw
Superior Essex
Target
Tarkett
Teknor Apex
EDF
HPDC
NWGC
TURI
ToxServices

GC3 Project on Cyclic Siloxanes in Personal Care Products

(AKA cyclic silicones, cyclomethicones, e.g., D4, D5, D6)

EU Effectively Bans D4 and D5 in Wash-off Products

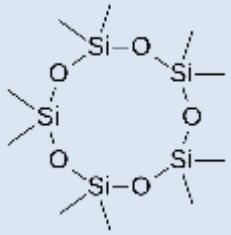
February 23, 2018 | Contact Author | Brooke Schleehauf

The European Commission acted to restrict the use of silicones octamethylcyclotetrasiloxane (D4) and decamethylcyclopentasiloxane (D5) in wash-off personal care products this past January.

The European Commission classifies D4 and D5 as persistent, bioaccumulative and toxic (PBT) very persistent and very bioaccumulative (VPvB) substances, respectively.

Notably, the new restriction applies only to wash-off products—D4 and D5 eventually evaporate from products intended for prolonged contact with the skin or hair and thus p environmental risk, whereas the ingredients enter the water supply before evaporating from wash-

Applicable products containing either ingredient in a concentration higher than 0.1% will not be al European market after Jan. 31, 2020.



Cyclopentasiloxane (D5)

The European Commission classifies D4 and D5 as persistent, bioaccumulative and toxic (PBT) very persistent and very bioaccumulative (VPvB) substances, respectively.

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Nouryon

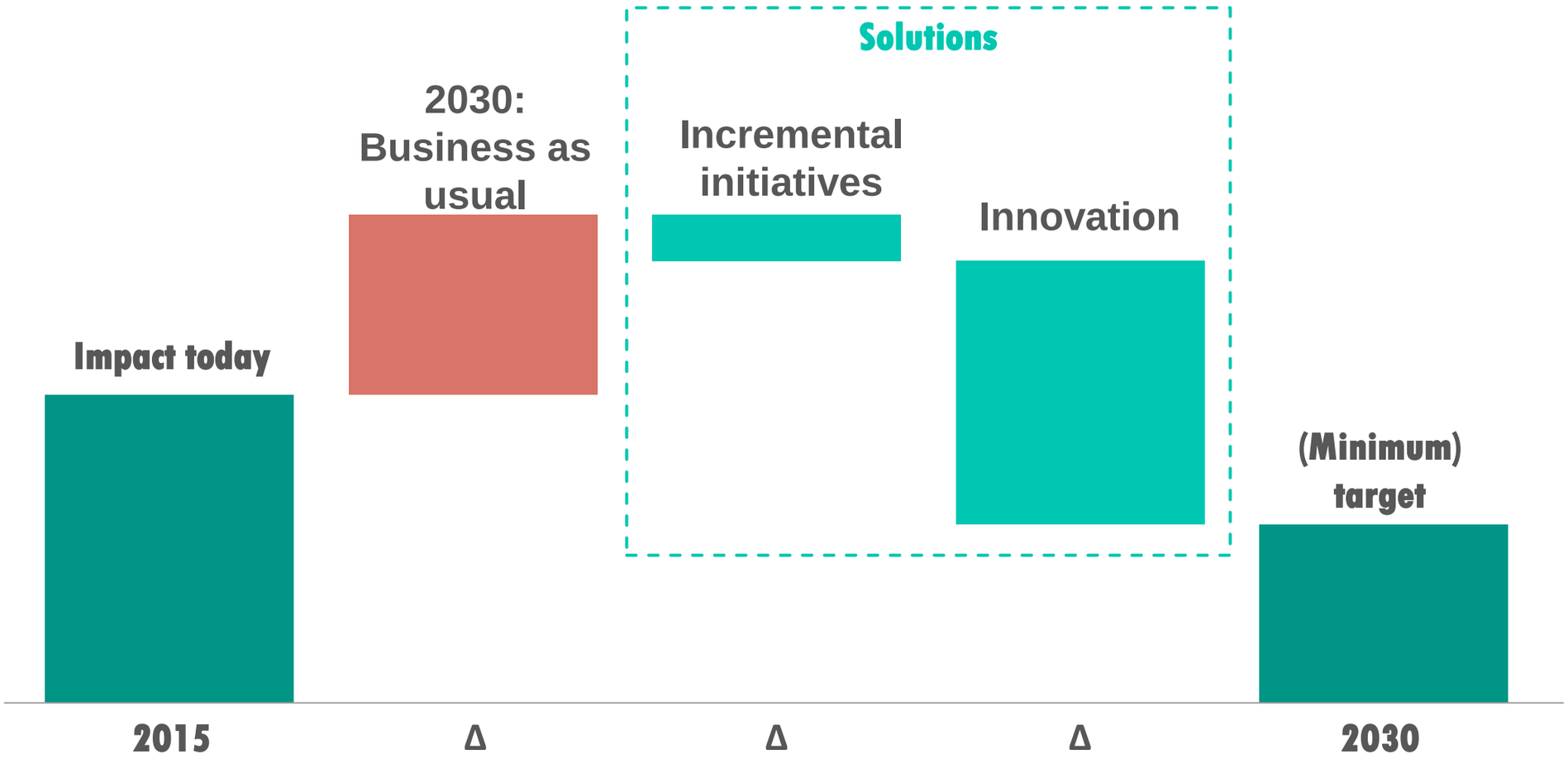
Fashion for Good

Innovation platform

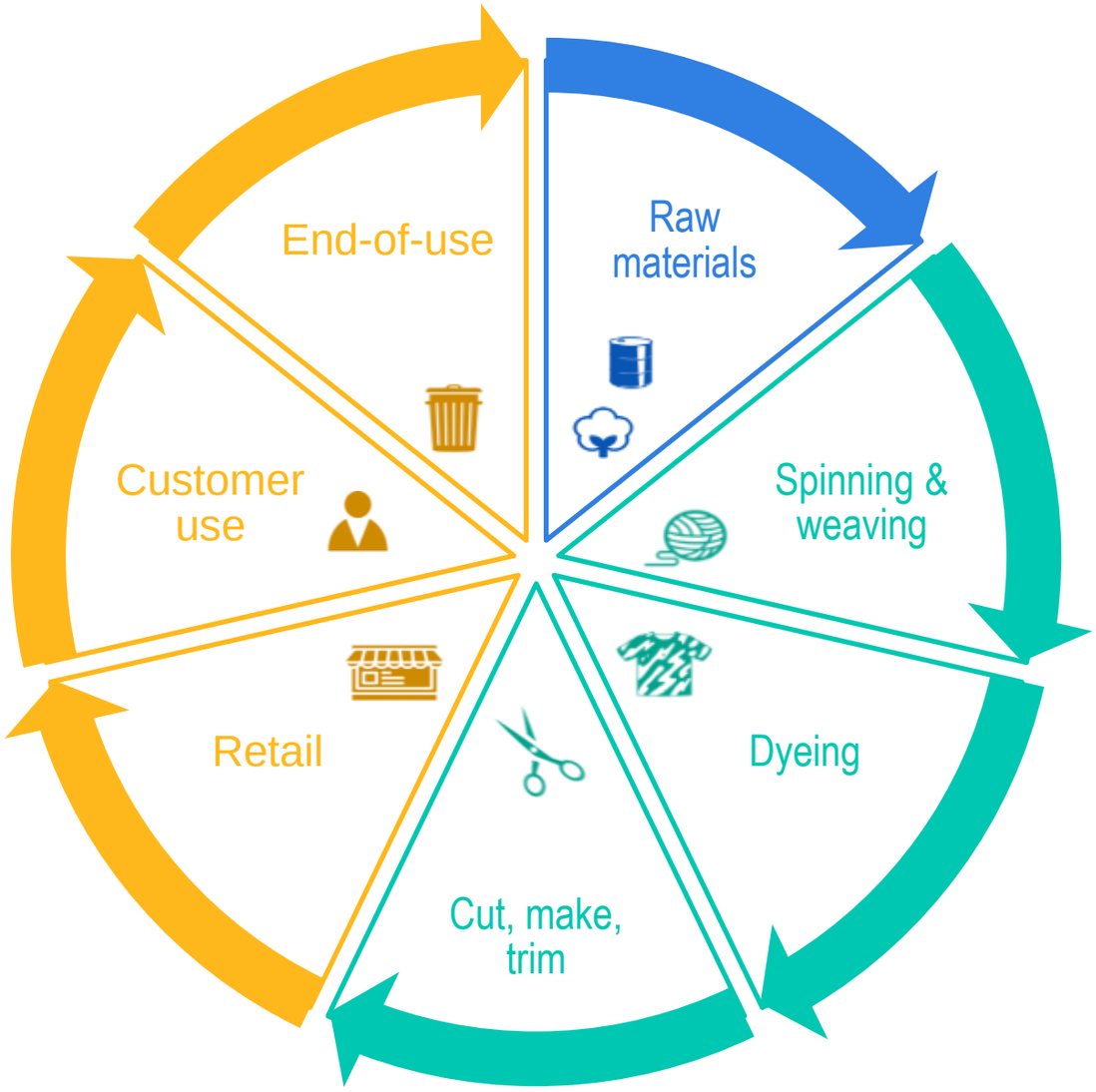
GC3 Innovation Roundtable

May 2019

INCREMENTAL INITIATIVES WILL BE OFFSET BY GROWTH OF THE INDUSTRY. INNOVATION IS NEEDED



COLLABORATIVE INNOVATION TO TACKLE FASHION'S BIGGEST CHALLENGES



Collaborative Innovation creates value:

1. **Pre-competitive** space is abundant and does not encroach on Brand differentiation.
2. **Cost-savings** through joint efforts.
3. **Common industry standards** a pre-requisite for circular innovation

OUR 3-STEP APPROACH TO DRIVING SYSTEMIC CHANGE THROUGH INNOVATION

1. ACCELERATE

Accelerator Programme

- Market validation
- Generate pilot and investment opportunities

2. SCALE

Scaling Programme

- Drive growth and adoption rate
- Bespoke support
- Graduates of Accelerator

3. MAINSTREAM

GOOD FASHION FUND

- Finance supply chain investments into circular apparel innovations
- Initial focus on Bangladesh, India and Vietnam

DEAL FLOWS: PROVIDING INNOVATORS DIRECT ACCESS TO BRAND PARTNER

FASHION FOR GOOD | PLUG AND PLAY

pond Textile

dropel

GREEN WHISPER

ColoriFix
Life isn't black and white

TIPA
Sustainable Packaging

CHECKERSPOT

NATURE COATINGS

COLORZEN
THE POWER OF LESS

worn again

NATURAL FIBER WELDING

The Infinited Fiber Company®

Algalife

NANO TEXTILE

TYTON BioSciences

C&A Foundation

adidas

Groupe Lafayette

KERING

STELLA McCARTNEY

BESTSELLER

C&A

otto group

PVH

zalando

NINESIGMA

We find, we connect.
We make innovation happen

Frank Tropper, Ph.D., Sr. Director – Global Programs

NineSigma corporate highlights

NineSigma

A pioneer in OI since 2000, NineSigma has established one of the largest and most diverse ‘Global Open Innovation Networks’

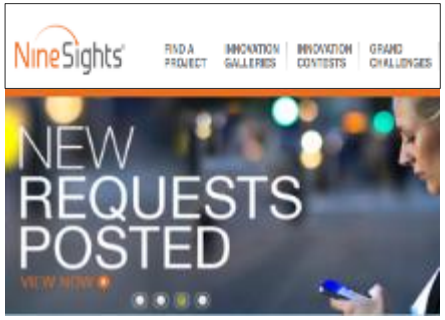
- Global Presence: US, Europe, Asia
- Largest Network: 2 million+
- >5,000 OI Projects
- Experience in nearly all domains
- Broad Technical Expertise

Services

FINDING SOLUTIONS & IDEAS

TECHNOLOGY SEARCH

INNOVATION GALLERY



INTERNAL IDEATION PLATFORM

CREATING IMPACT

INNOVATION CONTEST

ENHANCING CAPABILITIES & INSIGHTS

TARGETED PARTNER SEARCH

EXPERT ADVISORY SERVICE

TECHNOLOGY LANDSCAPING

WORLD CHANGING

GRAND CHALLENGE

NINESIGMA IS A LEADER IN MANAGING COMPLEX PRIZE BASED OI CHALLENGES

Our Clients' prize-based challenges include:

See these and other NineSigma managed prize-based technical challenges at www.ninesights.ninesigma.com/contests and www.ninesights.ninesigma.com/gc

NEW PLASTICS ECONOMY

INNOVATION PRIZE

Calling designers, entrepreneurs, academics and scientists to rethink the plastics system and eliminate plastics packaging waste

openIDEO

Designing Circular Solutions Challenge

NineSigma

Accelerating the Innovation Cycle

CIRCULAR MATERIALS CHALLENGE

How might we make all plastic packaging recyclable?

ELLEN MACARTHUR FOUNDATION

INTERNATIONAL SUSTAINABILITY UNIT

Eric & Wendy Schmidt Fund for STRATEGIC INNOVATION

We need everyone to work together to bring these ideas to life

PHILANTHROPIC FUNDERS

CORE PARTNERS

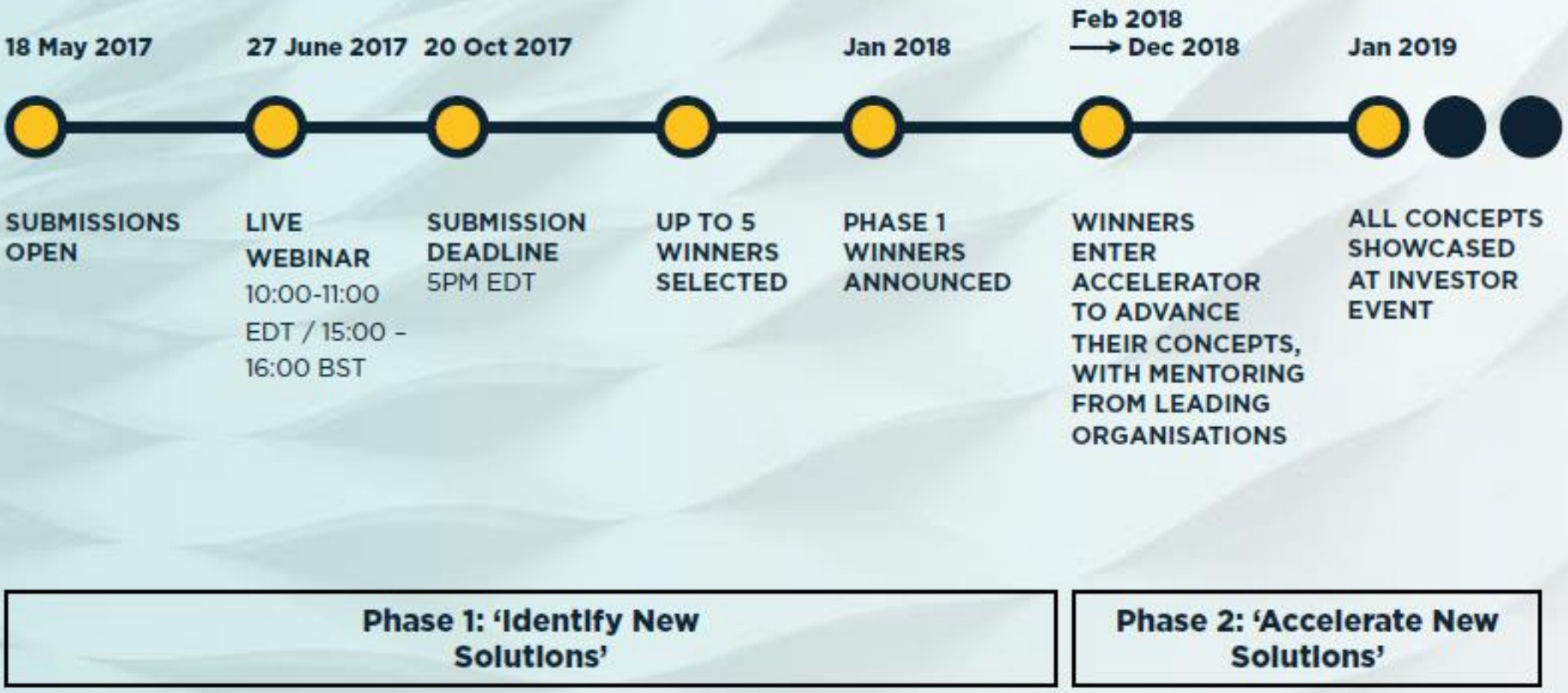
Challenge Focus:

Recycling multi-material laminate packaging films

The solutions could be a completely new material, a new formulation or variant of existing materials, or existing materials used in a new way to create **a recyclable mono-material or a fully bio-based, compostable mono- or multi-material** with the potential to:

- **provide barrier properties** suitable for packaging liquid, moist or dry products.
- be **manufacturable** for consumer products packaging (eg suitable mechanical properties; safe to use in food applications).
- be **collected, recycled or composted after use**, as part of a feasible collection and sorting route (either in widely used existing systems or a system that could be developed and used widely)

PROCESS AND OUTCOMES



PROCESS AND OUTCOMES

Judging Panel - materials experts from leading companies in the packaging, food, recycling and materials manufacturing sectors

- **63** qualified responses from **23** countries
- Top **30** reviewed with **13** approaches proceeding to deeper due diligence
- The judging panel found it very difficult to select the winners given the quality of the shortlisted proposals.

- **Some panel members found solutions that they could "use in their product packaging now"**

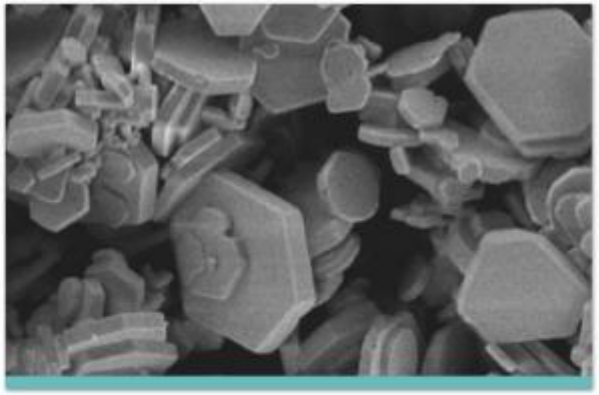
Circular Materials Challenge winners announced!

NineSigma

University of Pittsburgh

Recyclable, flexible and durable packaging created through nano-engineering.

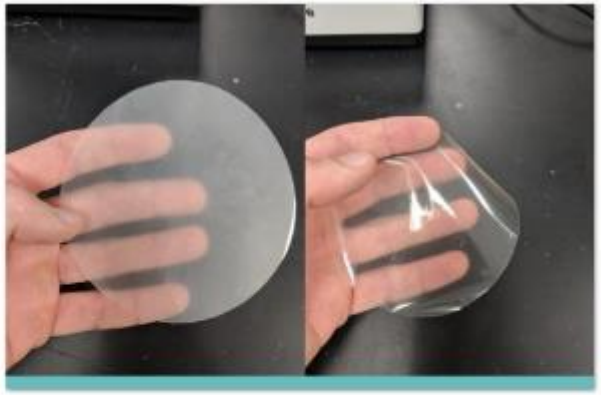
Circular Materials Challenge winner



Aronax Technologies Spain

A recyclable, magnetic coating that replaces multi-layered packaging.

Circular Materials Challenge winner



Full Cycle Bioplastics

Packaging made from wood and plant waste, which can be fed to bacteria and turned into new plastic again.

Circular Materials Challenge winner

VTT Technical Research Centre of Finland

Packaging that looks and feels like plastic, but is made from wood.

Response quality was so good that EMF decided to reward and mentor an additional 6 organizations

Fraunhofer Institute for Silicate Research

An organic coating for plastic that makes fresh food packaging compostable.

KEYS TO SUCCESS

- TBD: Think big / Be bold / Do good
- Committed partners and stakeholders across the value chain aligned to a common goal
- Properly define a problem with a specific target and semi-bounded solution criteria
- Provide an appealing opportunity to an engaged Solution Provider community
- Look for more than ideas to try to run with yourself – find partners with new expertise, insights, capabilities and technologies to reward, work with, support to achieve meaningful breakthroughs

NineSights®
A NineSigma Community

NIKE CIRCULAR INNOVATION CHALLENGE

The future demands a transition to a circular economy—a world in which materials can be used and reused at their highest potential. Nike is pushing the boundaries of the circular economy by transforming waste into value streams.

MATERIAL RECOVERY CHALLENGE

NIKE GRIND

NineSights™

A COLLABORATIVE ONLINE COMMUNITY THAT CONNECTS INNOVATORS OF ALL SIZES

WWW.NINESIGHTS.COM

Imagine Chemistry
Collaborative Innovation

GC3 Innovators Roundtable, Cincinnati, OH
May 7-9, 2019

Han Bevinakatti, Principal Scientist, Global R&D

Nouryon

Introduction to Nouryon

Formerly known as AkzoNobel Specialty Chemicals

A global specialty chemicals leader

Formerly AkzoNobel Specialty Chemicals

- Produce essential chemicals
- Top-tier performance in safety, sustainability, and reliability
- Growth driven by collaborative innovation
- Accelerating growth through operational excellence and strategic investments

About **10,000** employees worldwide

Operating in over **80** countries

€5.0 billion revenue in 2017

80% of our revenue comes from #1 or #2 positions

Supplying essential chemistry to markets worldwide

- Experts in highly demanding chemistry
- Supplying markets with essential chemicals for manufacturing everyday products
- Our products play an essential role in everyday life

Growth driven by innovation

- A portfolio rich with innovative products
- Investing in RD&I to drive growth, create safer and more sustainable products and processes, and improve the way we work
- Opening up to the ideas and enthusiasm of outsiders to achieve our full potential and help build a more sustainable industry
- Working closely with customers and partners to develop sustainable solutions

700 employees in RD&I

€100 million per year invested in RD&I

More than **5,000 patents**

Imagine Chemistry challenge generated **over 500 ideas**

Imagine Chemistry Collaborative Innovation Challenge

Imagine Chemistry

Solving real business challenges and making a better world with chemistry

Collaborate as ***equals***, by being ***transparent***, ***listening*** *and* ***learning*** from each other

Startup solutions

- Fresh ideas
- New perspectives
- Passion and energy

Nouryon global capabilities

- Bring ideas from lab to production
- Safety and operational exellence
- Global footprint

"We seek to get infected by start-up passion; in exchange offering our experience, capabilities and route-to-market"

A unique approach

Intensive collaboration for route to market

Unique approach
An year's work in 3 days! By bringing together all decision makers to decide on the spot

Business impact
Focused on real-life business challenges. Solutions can be brought to market

Collaborative approach
Not a beauty contest but a joint development. No IP claims in advance and shared IP

One-stop shop & deep screening
Cover all aspects of business plan in 1 event: 70+ experts, decision makers and partners

Imagine Chemistry, now in its 3rd year

Deventer 2017

The Netherlands

Gothenburg 2018

Sweden

Deventer 2019

The Netherlands

2018 Finals Gothenburg

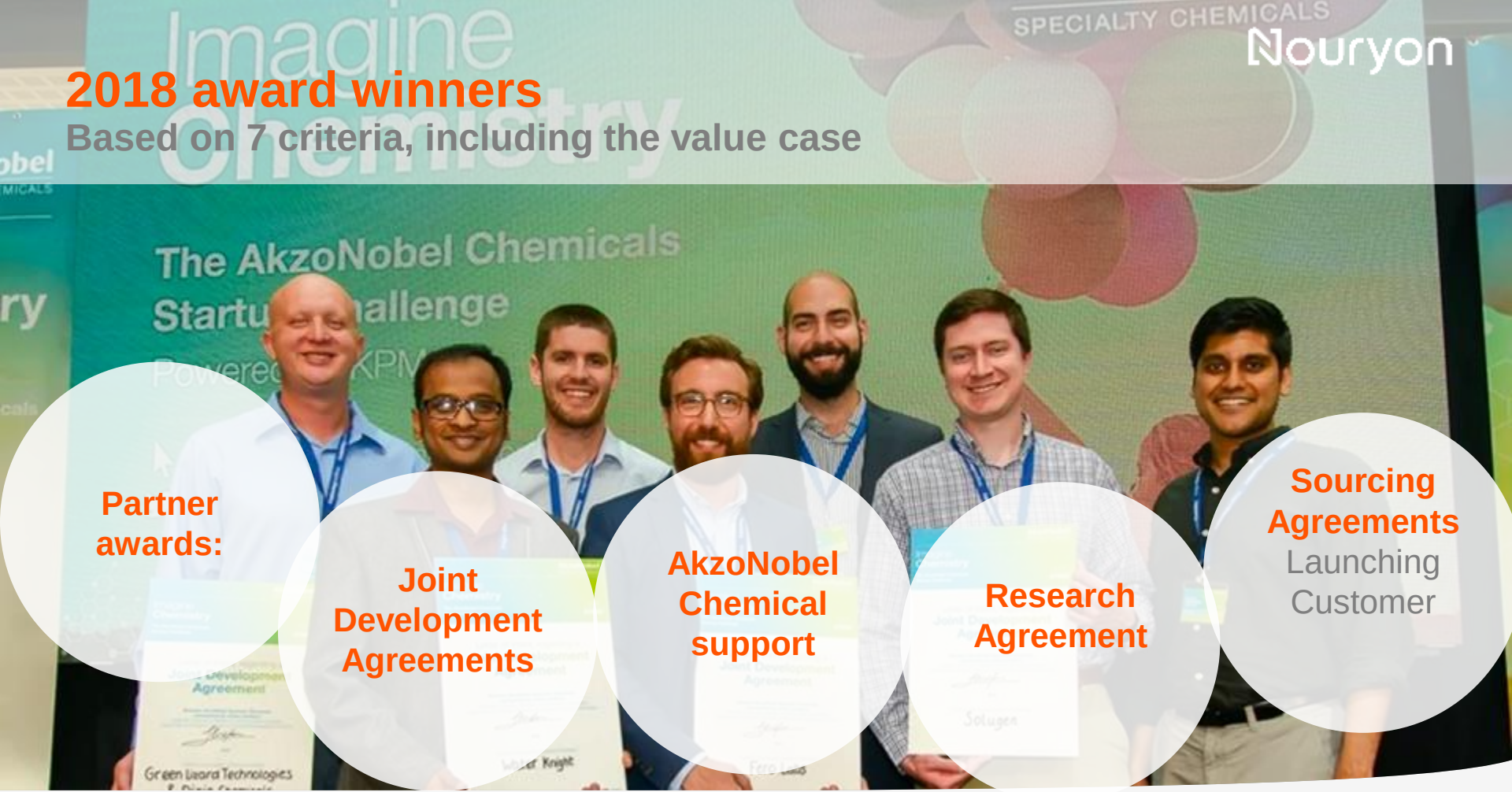
- 20 Mentors
- 40 Finalists
- 70 Experts
- 140 Individual sessions

And many, many others
…a lot of networking

✓ Ideas into joint value case

2018 award winners

Based on 7 criteria, including the value case



Partner awards:

Joint Development Agreements

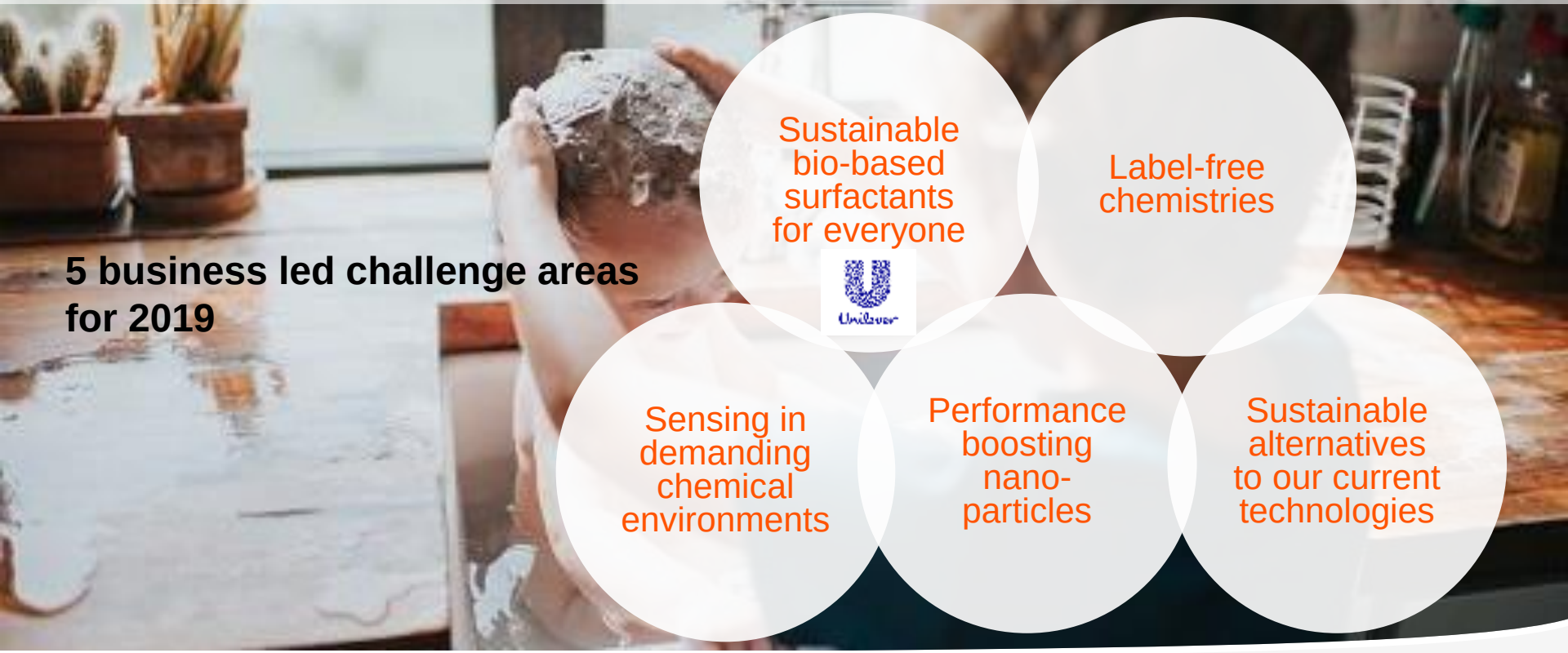
AkzoNobel Chemical support

Research Agreement

Sourcing Agreements
Launching Customer

Imagine Chemistry 2019 – 3rd Edition

The Challenge topics change every year



5 business led challenge areas for 2019

- Sustainable bio-based surfactants for everyone (Unilever)
- Label-free chemistries
- Sensing in demanding chemical environments
- Performance boosting nano-particles
- Sustainable alternatives to our current technologies

The 2019 finalists are again a diverse group from all over the world

Sustainable bio-based surfactants (in partnership with Unilever)	
CarbExplore Research	The Netherlands
Fraunhofer IGB	Germany
Sironix Renewables	USA
The University of Sheffield + Entomics	GB

Label-free chemistries	
Intelligent Fluids	Germany

Performance-boosting nanoparticles	
RISE	Sweden

Sensing in demanding chemical environments	
Arenal Process Control Solutions	The Netherlands
Fluence Analytics	USA
Ingu Solutions	Canada

Pushing the frontiers of chemical innovation	
Altum Technologies	Finland
Cambridge Carbon Capture	UK
Ionomr	Canada
Kansas State University	USA
Beijing University	China

Who can submit a solution?

Proof-of-principle to full product

Startups

You have a proven concept which could be a solution for one of our business challenges.

Scaleup

You have successfully lanched your product and are ready to explore new applications and markets

Suppliers

You have a solution working in a different market that matches one of our business challenges

Universities

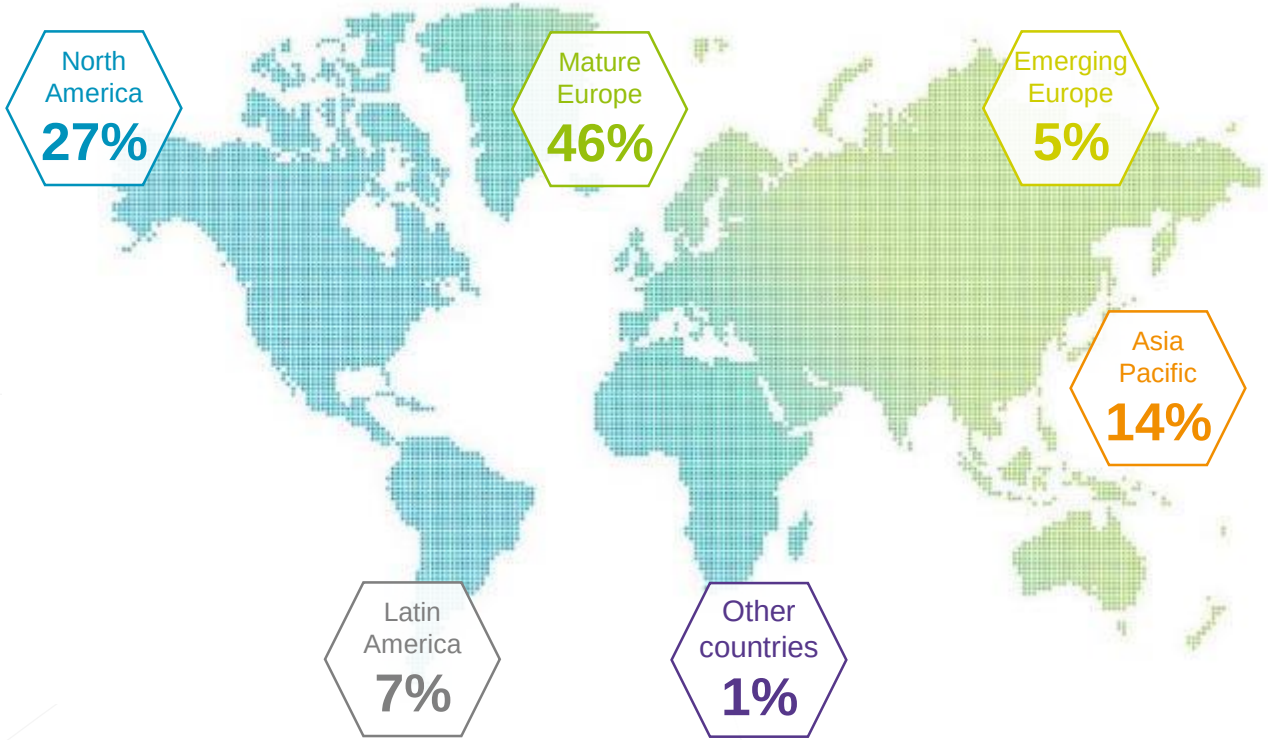
You work at a university and you have a proven concept that is ready for valorization.

Research Center

You work at a research institute and you have a proven concept that is ready for valorization.

Three Editions of Imagine Chemistry

Over 500 submissions with a truly global spread



Strong external partners

Outreach, content and win-win

GREEN CHEMISTRY & COMMERCE COUNCIL

luxresearch

ICOS CAPITAL

enterprise europe network
Business Support on Your Doorstep

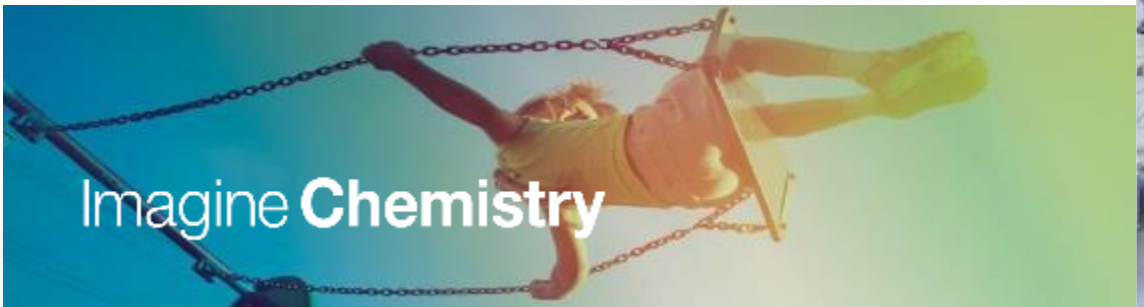
High-Tech Gründerfonds

StartupDelta

Unilever

Innovate UK
Knowledge Transfer Network

S/PARK



Thank you!

Join us

imaginechemistry.com

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imaginechemistry@nouryon.com