GC3 INNOVATORS ROUNDTABLE

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GC3: A Ten Year Perspective

Joel A. Tickner, ScD

April 28, 2015

GREEN CHEMISTRY & COMMERCE COUNCIL

Business Mainstreaming Green Chemistry

How has the world changed in the past 10 years and how does that affect Green Chemistry?

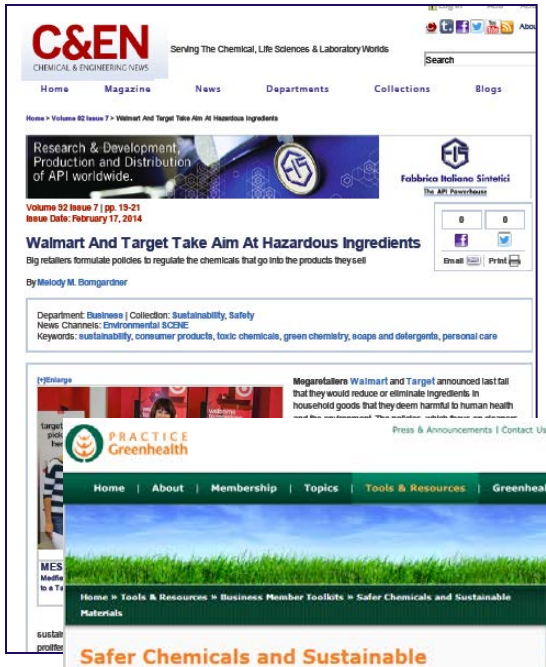
2005

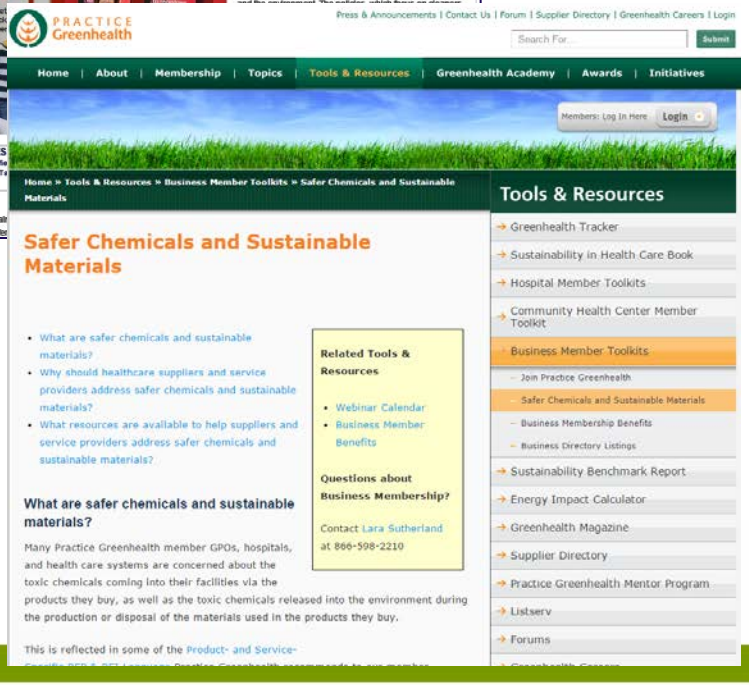
2015

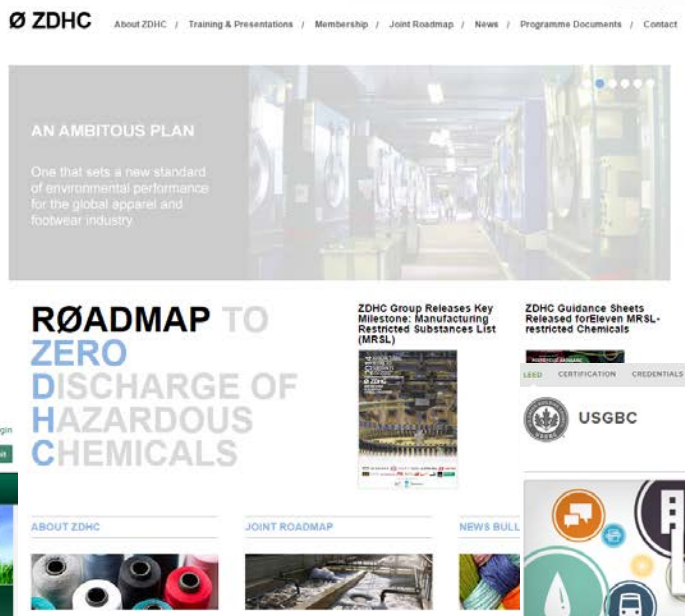
What a difference 10 years makes

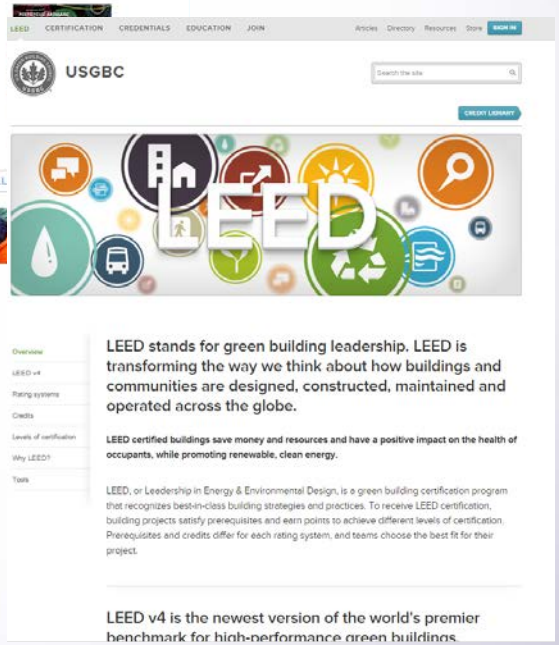
- Changes in markets
- Changes in policy
- Changes in science
- Changes in chemistry/growth of green chemistry
- Growth of the GC3

Market drivers









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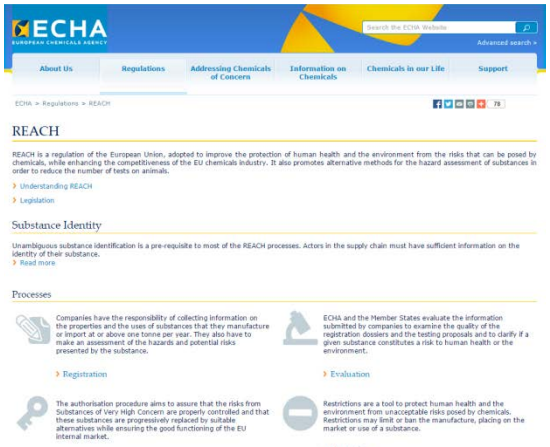
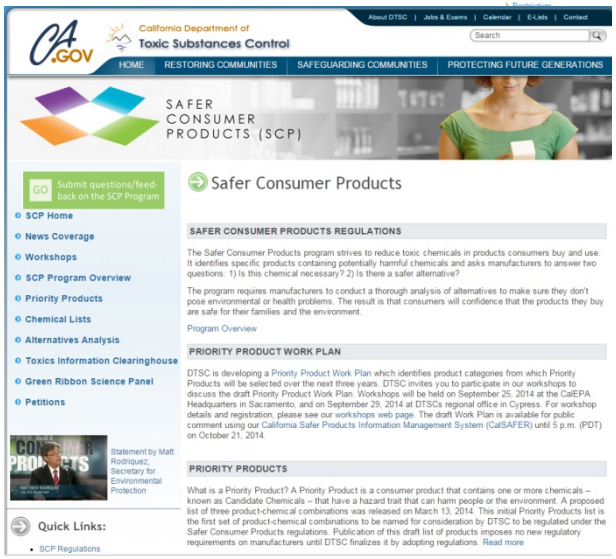
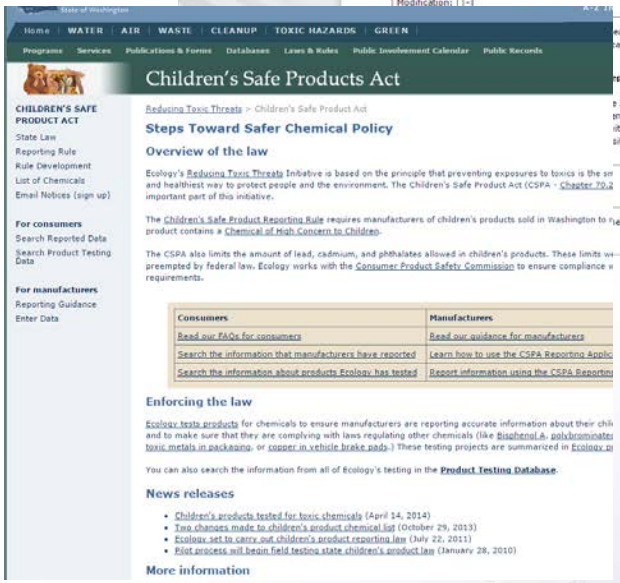
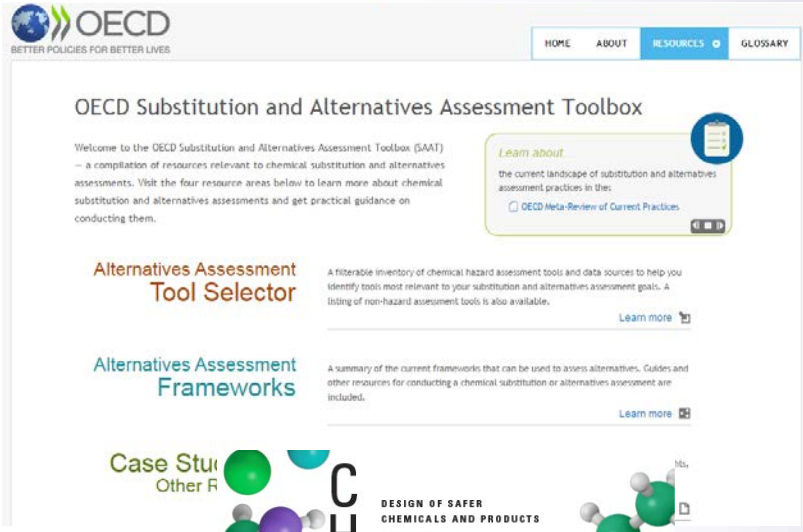
Policy Drivers

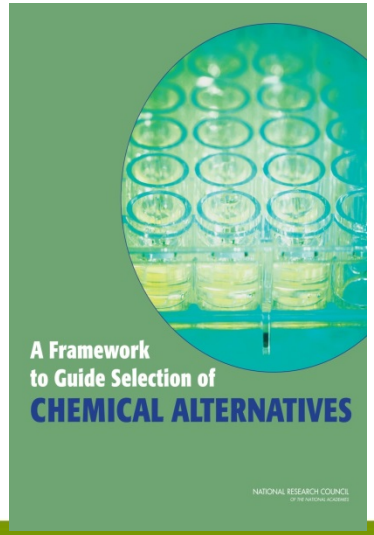


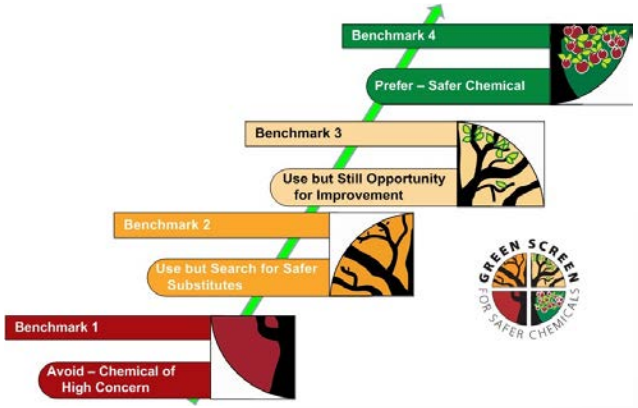


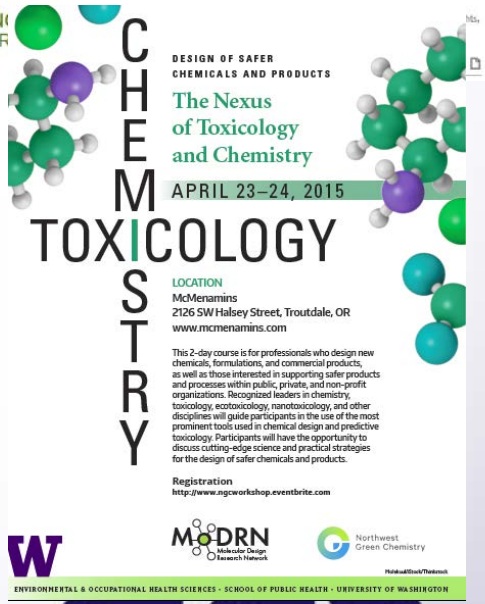


Science Drivers









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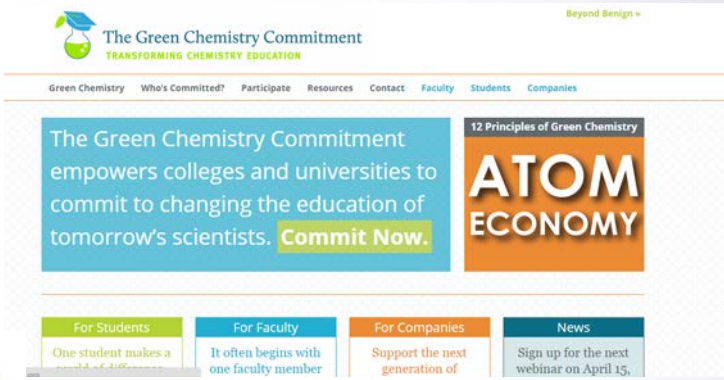
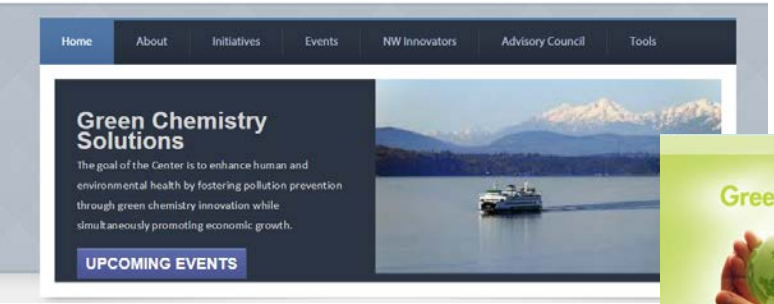
Growth of Green Chemistry Efforts



re:chem

Renewable Chemicals and Materials Alliance



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But have we mainstreamed green chemistry?

- A time when…

Green chemistry becomes standard practice throughout the economy so that all chemistry is, by default, green chemistry

We have made progress but have a long way to go…

- Despite significant successes in programs, collaborations and recognition of need, it's still a marginal consideration.
- The green chemistry community lacks a coherent long term strategy, strong coordination, and significant, stable funding.
- Much of the progress has been on the demand side and not on the supply side.

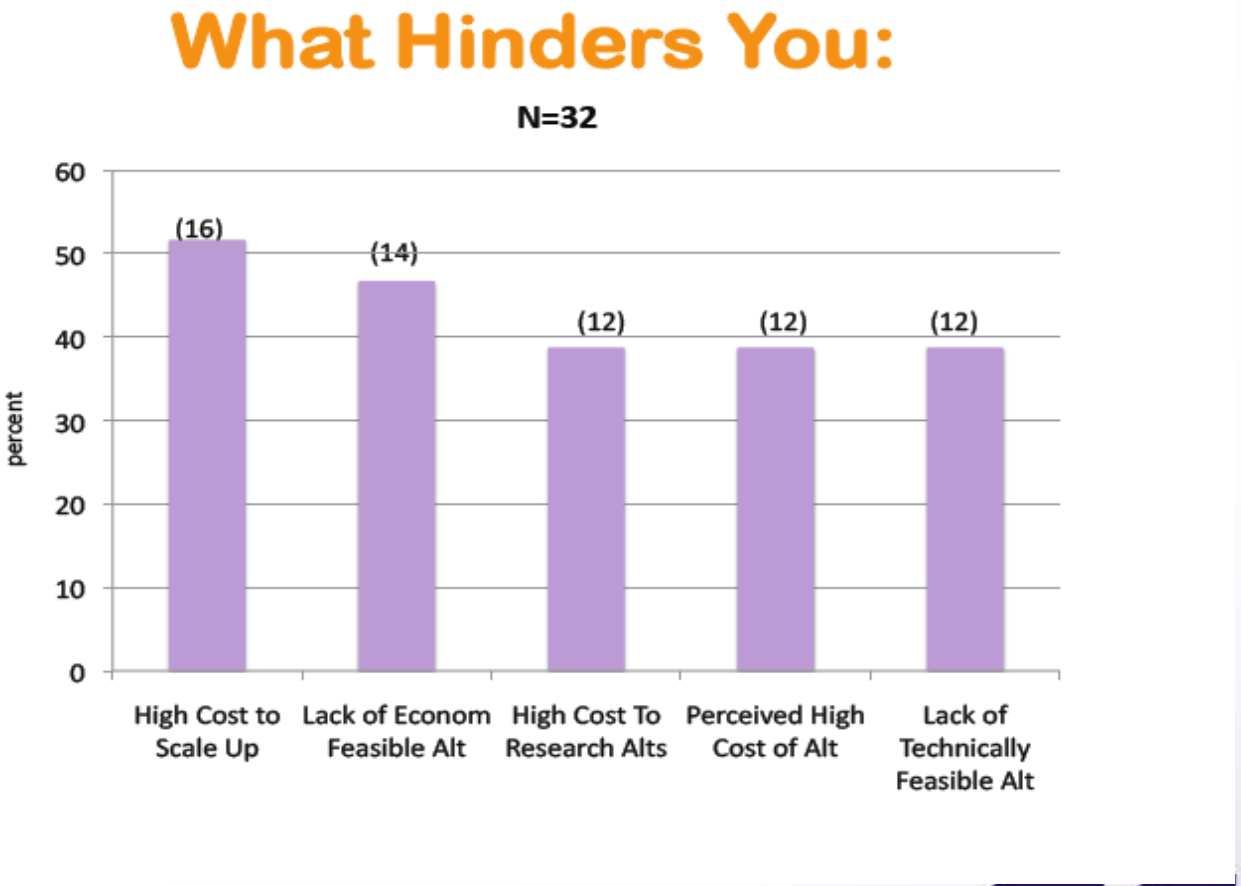
Themes from GC3 Launch in 2005

- Lack of a common definition
- Lack of good information through supply chains
- Lack of demand for green chemistry solutions
- Resistance to change (internal/external)
- Negative perceptions of green chemistry
- Need for data to make business case
- Need supply chain and cross-sectoral partnerships to drive solutions

10 Years Ago…

- “When we innovate, we’ve got to be prepared to be called nuts... First they ignore the innovators and hope they’ll go away; then they laugh at you and hope the humiliation will drive you away; then they fight and attempt to stop the new idea; and then they join together and change happens. We all need to join together to drive change.”

Themes from the 2014 GC3 Member Survey



Policies That Would Be Helpful

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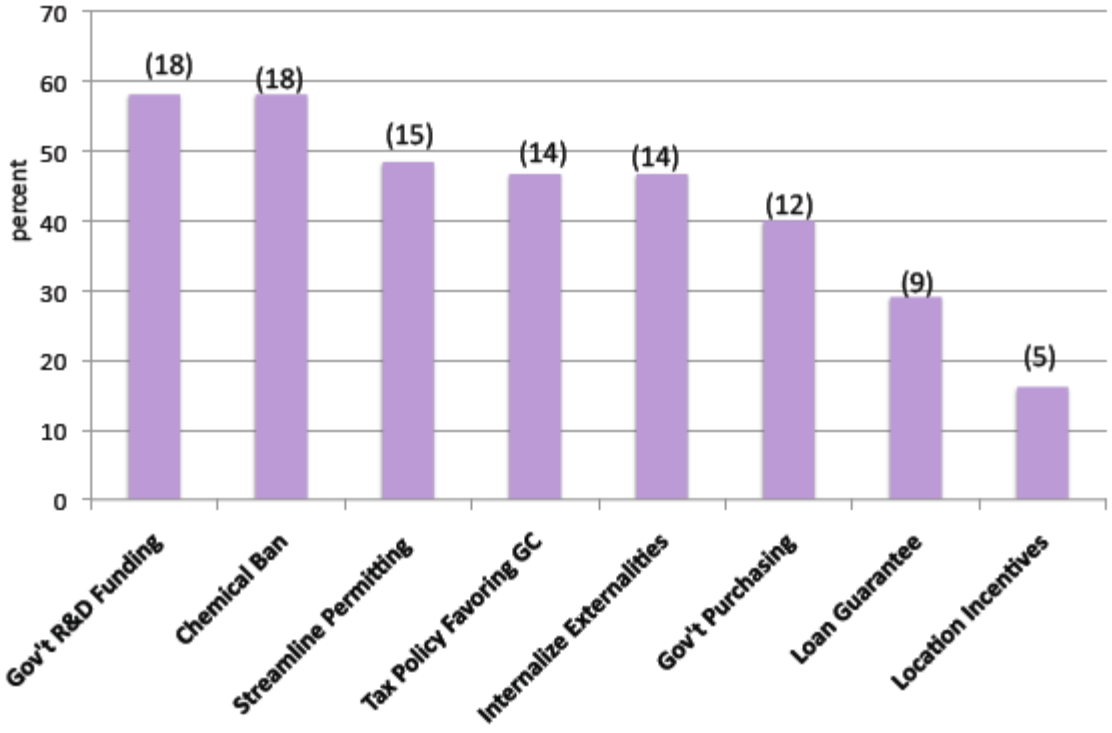
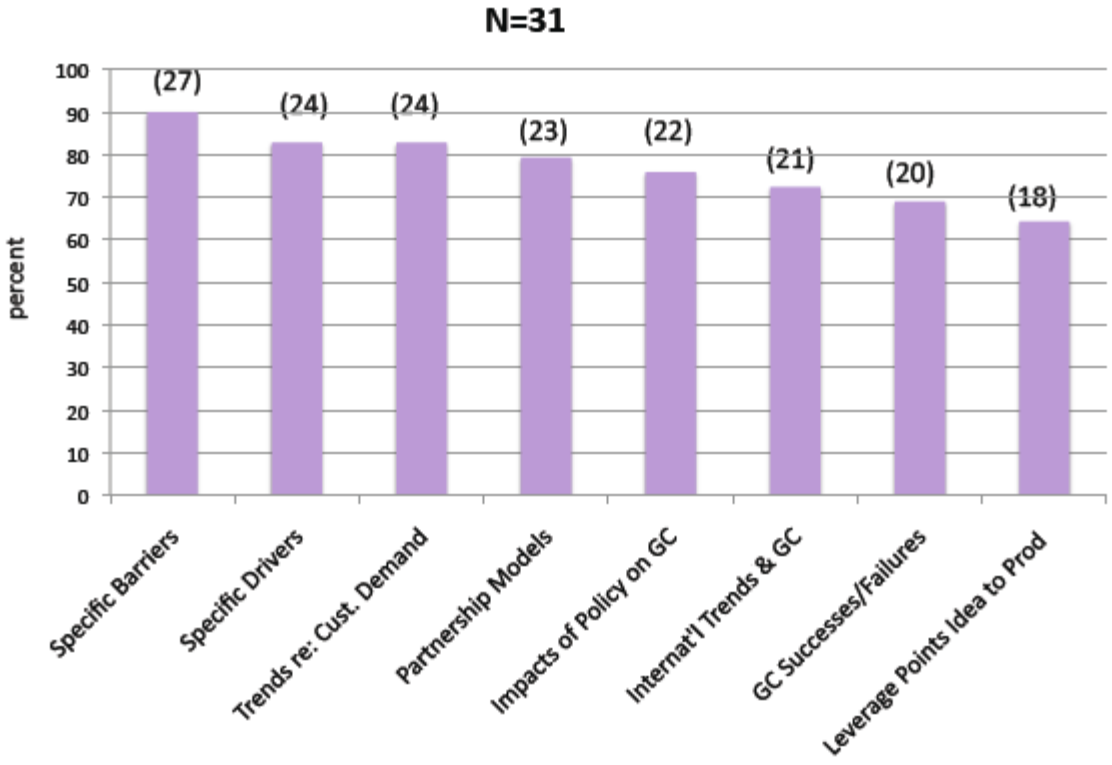


What We Need To Better Understand



Themes from GC3 Strategic Initiative Research 2014-2015

- Potential for creating business and economic value is promising but not yet fully realized. Change is happening but is limited, primarily reactionary and situational.
- There are important barriers to scale including supply chain complexity, incumbency, risk shifting, price/performance, perceived lack of demand, and market confusion.
- There are limited metrics to evaluate progress.
- There is a need for common understanding of terminology.

Lessons learned from research

- Need to address supply chain misalignment:
  - Collaboration across the value chain, including give and take (compromise)
  - Use market forces to drive innovation
  - Need better data to make a business case and better, more consistent metrics
  - Need education across the supply chain

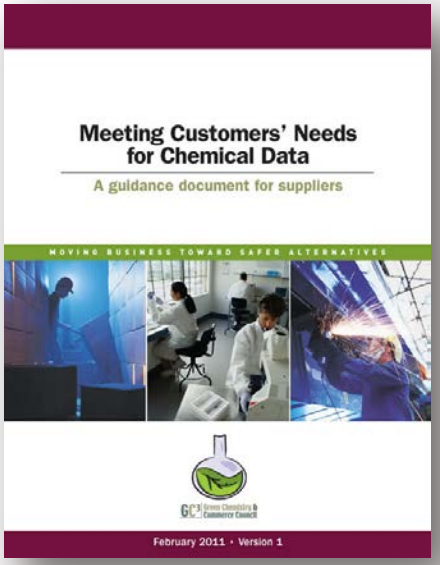
10 Years of GC3 Efforts to Mainstream Green Chemistry

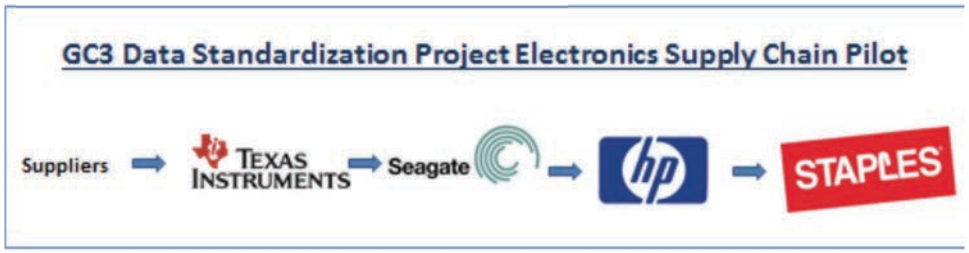
- Information
- Education
- Innovation
- Retail
- Mainstreaming
- Supply chain partnerships
- Collaboration and networking
- Outreach

Why has the GC3 been successful?

- Multi-sectoral and along the entire value chain
- Collaborative
- Visionary
- Pragmatic
- Positive, solutions focused
- Amazing collaborators

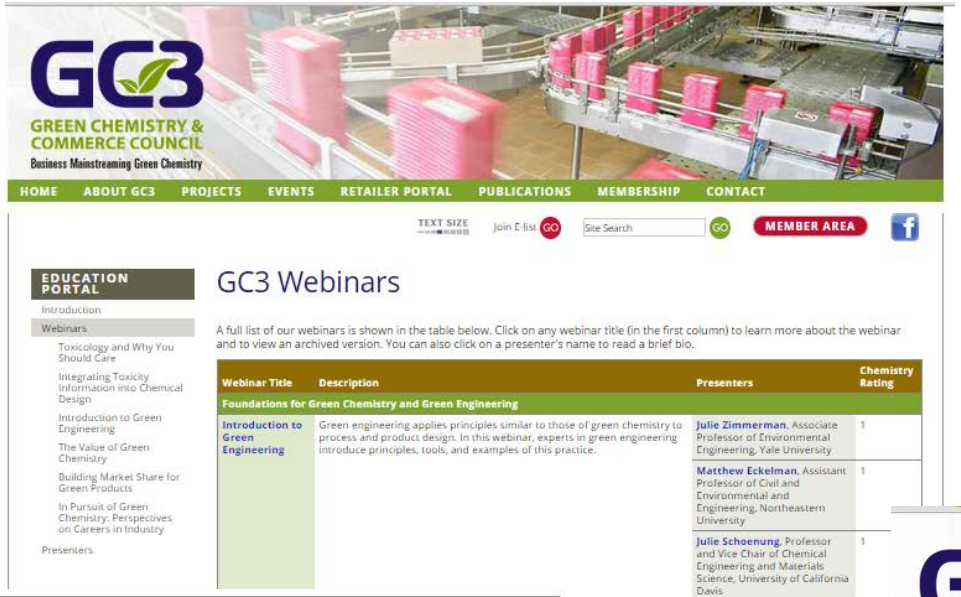
Enhancing information flow through supply chains





GC3 Approach to Enhancing Business to Business Information Flows while Protecting Confidential Business information

Education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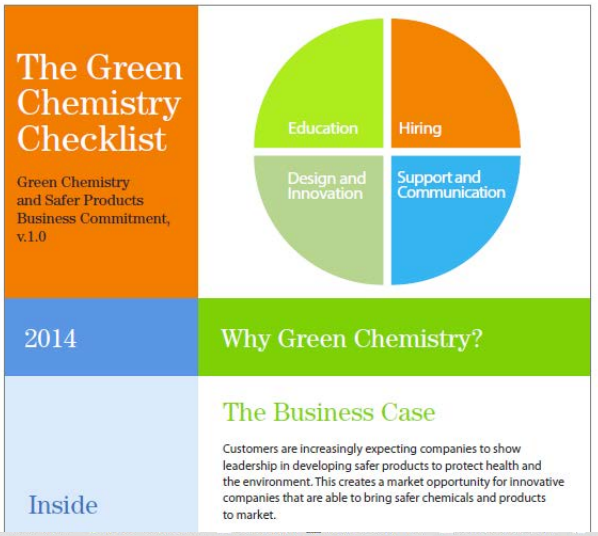
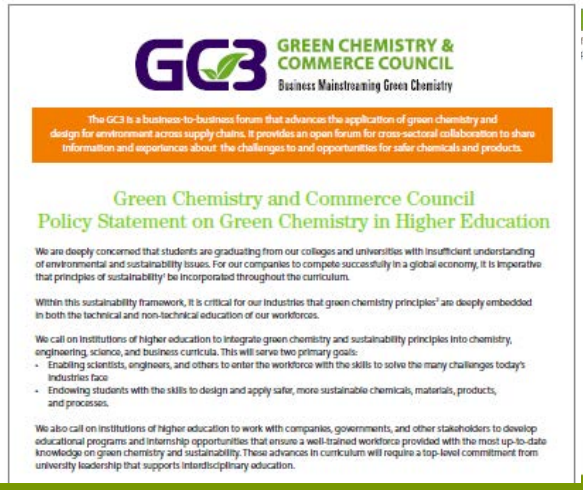
Integrating Toxicity Information into Chemical Design
Introduction to Green Engineering
The Value of Green Chemistry
Building Market Share for Green Products
In Pursuit of Green Chemistry: Perspectives on Careers in Industry
Presenters
GC3 Webinars
A full list of our webinars is shown in the table below. Click on any webinar title (in the first column) to learn more about the webinar and to view an archived version. You can also click on a presenter's name to read a brief bio.
Webinar Title
Description
Presenters
Chemistry Rating
Foundations for Green Chemistry and Green Engineering
Introduction to Green Engineering
Green engineering applies principles similar to those of green chemistry to process and product design. In this webinar, experts in green engineering introduce principles, tools, and examples of this practice.
Julie Zimmerman, Associate Professor of Environmental Engineering, Yale University
Matthew Eckelman, Assistant Professor of Civil and Environmental and Engineering, Northeastern University
Julie Schoenung, Professor and Vice Chair of Chemical Engineering and Materials Science, University of California Davis
Helen Holder, Corporate Material Selection Manager, Hewlett-Packard
Tse-Sung Wu, Program Manager of Environment, Health, and Safety, Genentech
Andy Shafer, Executive Vice


The Green Chemistry Checklist
Green Chemistry and Safer Products Business Commitment, v.1.0
Education
Hiring
Design and Innovation
Support and Communication
2014
Why Green Chemistry?
Inside
The Business Case
Customers are increasingly expecting companies to show leadership in developing safer products to protect health and the environment. This creates a market opportunity for innovative companies that are able to bring safer chemicals and products to market.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Business Mainstreaming Green Chemistry
The GC3 is a business-to-business forum that advances the application of green chemistry and design for environment across supply chains. It provides an open forum for cross-sectoral collaboration to share information and experiences about the challenges to and opportunities for safer chemicals and products.
Green Chemistry and Commerce Council
Policy Statement on Green Chemistry in Higher Education
We are deeply concerned that students are graduating from our colleges and universities with insufficient understanding of environmental and sustainability issues. For our companies to compete successfully in a global economy, it is imperative that principles of sustainability[1] be incorporated throughout the curriculum.
Within this sustainability framework, it is critical for our industries that green chemistry principles[2] are deeply embedded in both the technical and non-technical education of our workforces.
We call on institutions of higher education to integrate green chemistry and sustainability principles into chemistry, engineering, science, and business curricula. This will serve two primary goals:
- Enabling scientists, engineers, and others to enter the workforce with the skills to solve the many challenges today's industries face
- Endowing students with the skills to design and apply safer, more sustainable chemicals, materials, products, and processes.
We also call on institutions of higher education to work with companies, governments, and other stakeholders to develop educational programs and internship opportunities that ensure a well-trained workforce provided with the most up-to-date knowledge on green chemistry and sustainability. These advances in curriculum will require a top-level commitment from university leadership that supports interdisciplinary education.


IMAGE PROVIDED BY GC3 MEMBER SHAW INDUSTRIES
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Business Mainstreaming Green Chemistry
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Past Project: Business & Academic Partnerships
Fellows Program 2015
GC3 Fellows Program 2015
The GC3 Fellows Program places technically proficient students into sustainability-related summer internships with our member companies. The fellows spend 10-12 weeks working within a GC3 member company, learning the skills needed in sustainable industry. After completing the program, this year's fellow will have the opportunity to attend the 2016 GC3 Innovators Roundtable and share their experiences with the next round of students.
Eligibility
In order to be considered for the GC3 Fellows Program, you must be...
- a current graduate student OR recent recipient of bachelor's degree (<6 months since graduation)
- specialized in a scientific/technical discipline
- eligible to receive payment for work in the U.S. during the summer term (citizens, residents, non-residents with applicable visas)
- passionate about advancing sustainability

Retail

GC3 Green Chemistry & Commerce Council
Moving Business Toward Safer Alternatives

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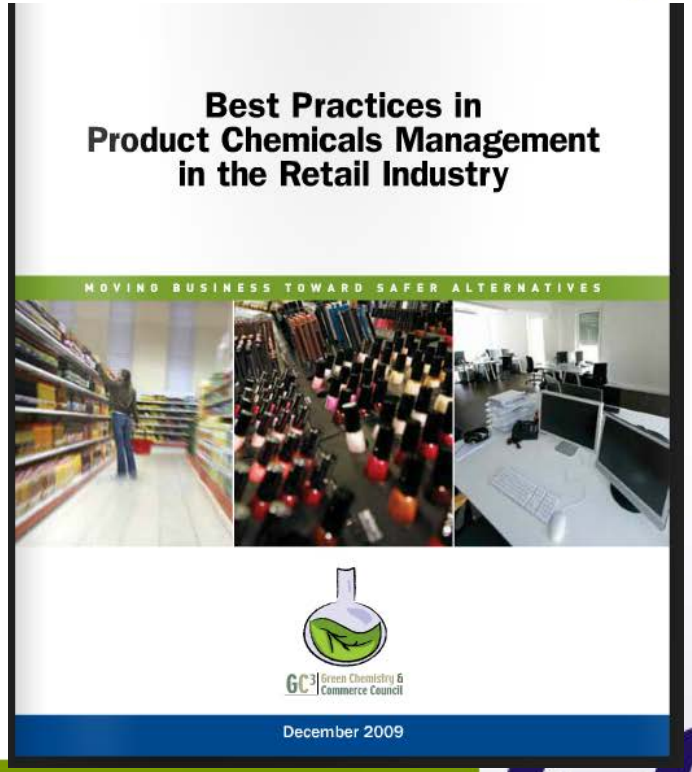
RETAILER PORTAL DATABASE

Tools to Evaluate Chemical Ingredients in Products

Key: Restricted Substances Lists | Standards, Certifications & Labels | Third-party Evaluation Tools

Apparel & Footwear						
Tools relevant to this product sector	Restricted Substances Lists (RSLs) e.g., AAFA RSL, ETAD	bluesign®	EcoLogo	Global Organic Textile Standard (GOTS)	Oeko-Tex® Standard 100	Outdoor Industry Association (OIA) Eco Index Beta
Tools relevant to all product sectors	Cradle to Cradle® Certification	3E Green Product Analyzer™ (GPA)	Actio Material Disclosure	Chemical Compliance Systems (CCS) Tools	GreenWERCS™	IHS Chemical Inventory Greening Solutions
Automotive						
Tools relevant to this product sector	Restricted Substances Lists (RSLs) e.g., GADSL	EcoLogo	EPA Design for Environment (DfE) Safer Product Labeling Program	Green Seal		
Tools relevant to all product sectors	Cradle to Cradle® Certification	3E Green Product Analyzer™ (GPA)	Actio Material Disclosure	Chemical Compliance Systems (CCS) Tools	GreenWERCS™	IHS Chemical Inventory Greening Solutions
Building Materials & Products						
Tools relevant to this product sector	Restricted Substances Lists (RSLs)	EcoLogo	Greenguard	Green Seal	SMaRT© 4.0 Sustainable Product Standard	Pharos Project

GC3 SECOND NATIONAL Summit for Retailers
Green Chemistry and Commerce Council
May 7, 2013 · New York City



GC3 Retailer Leadership Council - An Uncommon Collaboration

Mission: To promote safer chemicals, materials and products across retail supply chains.

GC3 Mainstreaming Efforts

H.R.5116

One Hundred Eleventh Congress
of the
United States of America

AT THE SECOND SESSION

Begun and held at the City of Washington on Tuesday, the fifth day of January, two thousand and ten

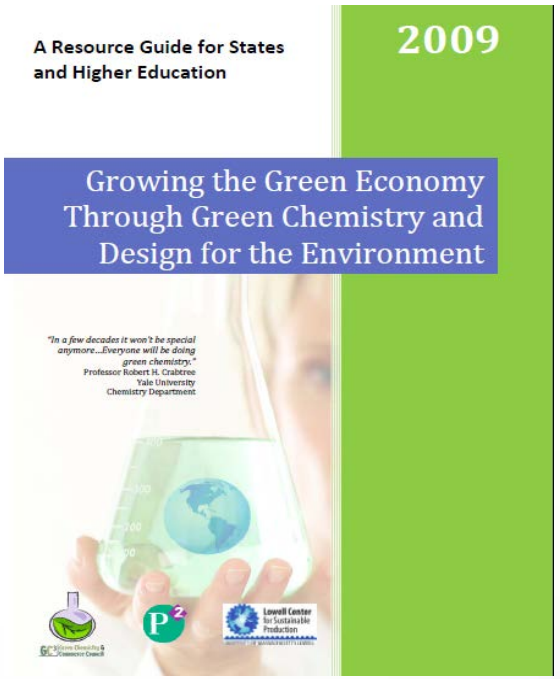
An Act

To invest in innovation through research and development, to improve the competitiveness of the United States, and for other purposes.

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—this Act may be cited as the "America COMPETES Reauthorization Act of 2010" or the "America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Reauthorization Act of 2010".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:



II

113TH CONGRESS
2D SESSION

S. 2879

To provide for the implementation of a Sustainable Chemistry Program, and for other purposes.

IN THE SENATE OF THE UNITED STATES

SEPTEMBER 18, 2014

Mr. COONS (for himself, Ms. COLLINS, Mr. ROCKEFELLER, and Mr. ISAKSON) introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

A BILL

To provide for the implementation of a Sustainable Chemistry Program, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "Sustainable Chemistry Research and Development Act of 2014".

SEC. 2. DEFINITIONS.

In this Act—

(1) ADVISORY COUNCIL.—The term "Advisory Council" means the advisory council established under section 3(d).


Foster Collaboration
Inform the Marketplace
Support Smart Policies
An Agenda for Mainstreaming Green Chemistry
Track Progress
Understand the Marketplace
GC3
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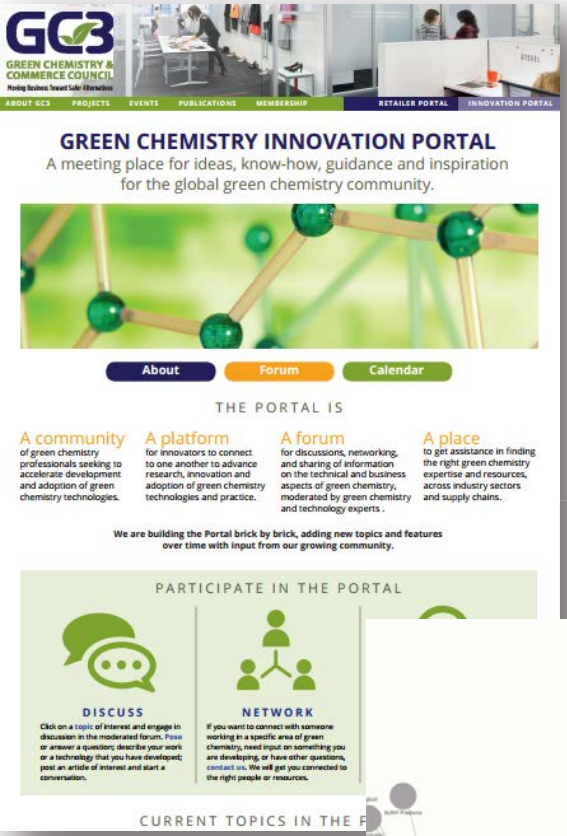
Innovation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GREEN CHEMISTRY INNOVATION PORTAL
A meeting place for ideas, know-how, guidance and inspiration for the global green chemistry community.
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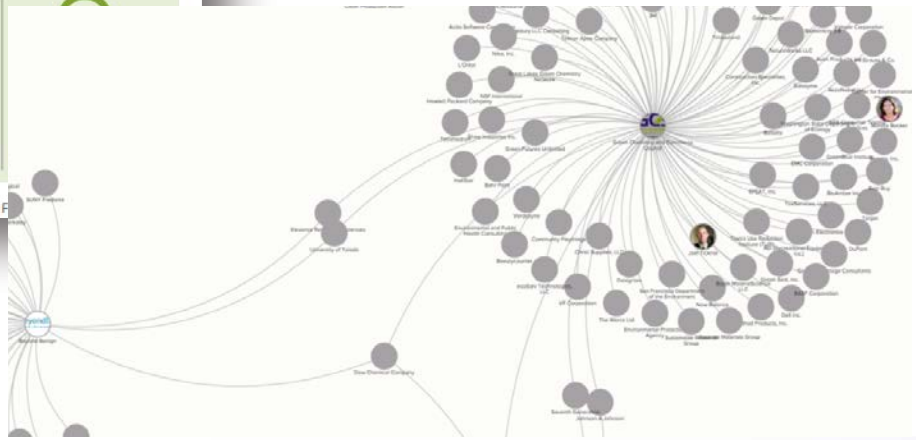
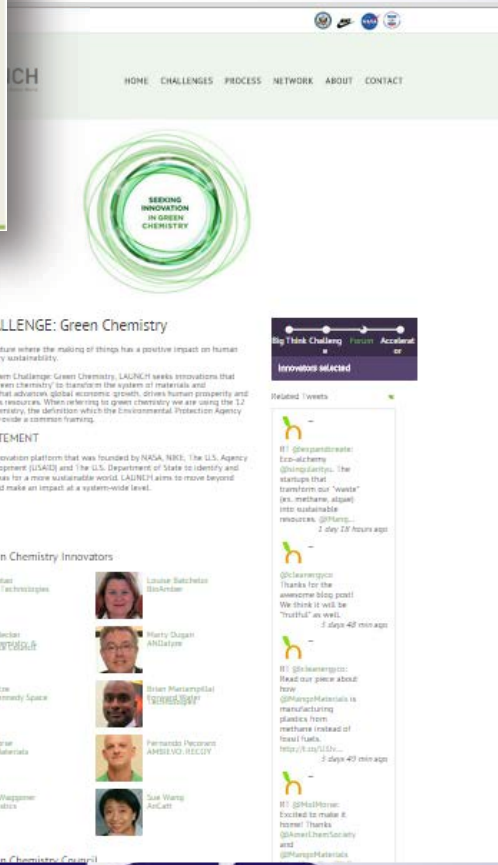
THE PORTAL IS
A community of green chemistry professionals seeking to accelerate development and adoption of green chemistry technologies.
A platform for innovators to connect to one another to advance research, innovation and adoption of green chemistry technologies and practice.
A forum for discussions, networking, and sharing of information on the technical and business aspects of green chemistry, moderated by green chemistry and technology experts .
A place to get assistance in finding the right green chemistry expertise and resources, across industry sectors and supply chains.
We are building the Portal brick by brick, adding new topics and features over time with input from our growing community.
PARTICIPATE IN THE PORTAL
DISCUSS
Click on a topic of interest and engage in discussion in the moderated forum. Pose or answer a question; describe your work or a technology that you have developed; post an article of interest and start a conversation.
NETWORK
If you want to connect with someone working in a specific area of green chemistry, need input on something you are developing, or have other questions, contact us. We will get you connected to the right people or resources.
CURRENT TOPICS IN THE F


November 8, 2012
Green Chemistry Innovation in the Chemical Industry: Venturing and Start-Ups
Cora Leibig, VP of R&D, Segetis
Erik Rutten, Senior Investment Manager, DSM Venturing

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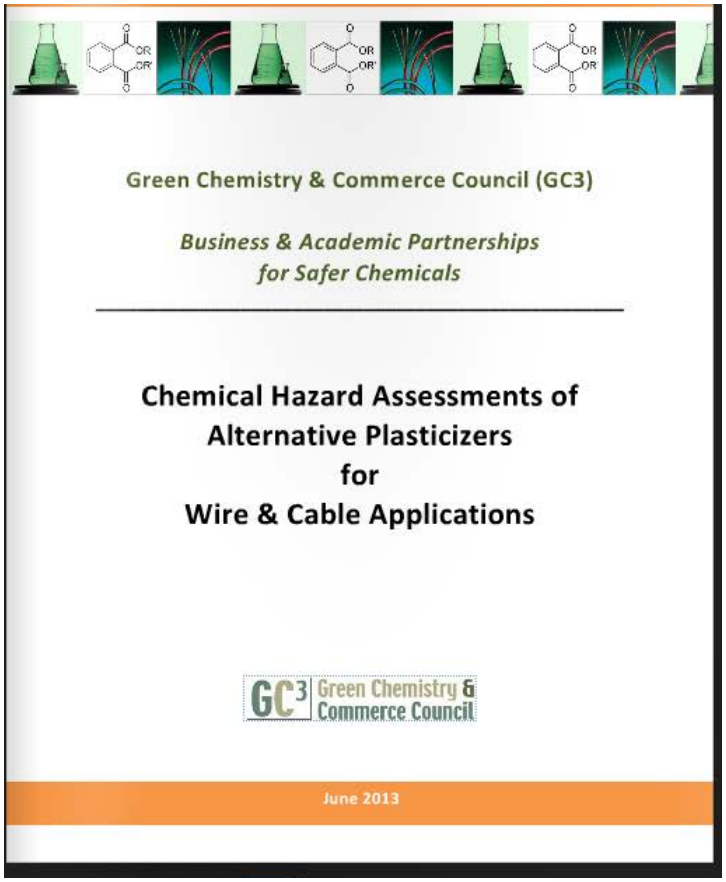
Innovators selected

Supply Chain Innovation Partnerships



Green Chemistry & Commerce Council (GC3)

Business & Academic Partnerships for Safer Chemicals

Chemical Hazard Assessments of Alternative Plasticizers for Wire & Cable Applications

GC3 Green Chemistry & Commerce Council

June 2013

GC3 GREEN CHEMISTRY & COMMERCE COUNCIL
Business Mainstreaming Green Chemistry

Need Statement

&

Development Criteria for New Preservatives for Personal Care & Household Products

Draft - 4/1/2015

Developed collaboratively by:

Aubrey Organics	Henkel	Procter & Gamble
Aveda	Johnson & Johnson	Seventh Generation
BabyGanics	L'Oreal	Unilever
Beautycounter	Method	

Compiled by:

The Green Chemistry & Commerce Council (GC3)

Collaboration and Networking

GC3 SECOND NATIONAL
Summit for Retailers
Green Chemistry and Commerce Council
May 7, 2013 · New York City

Education and Outreach

The Right Chemistry

Charting a path to make green chemistry mainstream

share this article

Amy Perlmutter
Friday, April 3, 2015 - 1:00am

Amy Perlmutter
Principal
Perlmutter Associates

Many companies want green chemistry, but how can we make it the norm?

Later this month, participants at the Green Chemistry & Commerce Council's 10th annual Innovators Roundtable will hear the results of the soon-to-be-released "Agenda to Mainstream Green Chemistry." This document is the culmination of a year of research into barriers, opportunities and needs to bring green chemistry into the mainstream.

The Green Chemistry & Commerce Council (GC3) is a business-to-business forum that advances the applicatio

GREEN CHEMISTRY & COMMERCE COUNCIL
Business Mainstreaming Green Chemistry

State Perspectives on Promoting Green Chemistry

Alister Innes, Green Chemistry Coordinator, Minnesota Pollution Control Agency

Mark Brady, Clean Technology Strategist, Business Oregon

CAREERS

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and coatings, including benign and easily degradable chelates, builders and polymers. He contacted other chemists for further ideas, collected samples and tested them in the company's dishwashers. He spent a year and a half on the project at Method Products in San Francisco, California, and his invention is now sold online and in US stores.

Holzhauer is part of a thriving subfield in chemical manufacturing known as green chemistry. As its name suggests, the field

CHEMISTRY

Green refill

Manufacturers are snapping up chemists who can ma their products more environmentally friendly.

BY RACHEL CERNANSKY

When chemist Fred Holzhauer started a job at a cleaning-products company in 2008, his first assignment was to create a tablet dishwasher detergent that contained no polyacrylates, or any other ingredients commonly found in dishwashing products that have negative impacts on human health and the environment. Of course, the detergent also had to work well in a — and to last for months on shop sh out degrading or losing effectiveness to be affordable.

First, Holzhauer assembled detergent he could put together. N out to find replacements for the that he wanted to avoid. He had l possible candidates from his 30 year ence in formulating industrial clea

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Green chemistry

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ChemicalWatch

A mission to become mainstream

Green chemistry is still a marginal consideration, how can we up the ante?

Joel Tickner
Associate professor, University of Massachusetts Lowell

There is a lot of energy and commitment to integrating green chemistry into education, government programmes and through supply chains

Last month, Launch (launch.org), a sustainable innovation incubator programme hosted by Nasa, the US State Department, the US Agency for International Development and Nike, held its Green Chemistry Forum. With Nasa Cape Canaveral Space Facility as a backdrop, the 10 launch green chemistry innovators, who have developed plastics from methane, bio-based chemistry building blocks and non-chromium based coatings, presented on their visions, practical realities and needs to move to scale.

These innovators – and many others – are seeking to rethink traditional chemistry, which has focused on price and performance, with an emphasis on renewable feedstocks, less hazardous chemical designs and reduced lifecycle impacts. The Green Chemistry and Commerce Council, a network of some 70 companies across sectors and levels of supply chains, has worked to "mainstream" green chemistry for the past decade, to achieve a point in time where it

[encompassing] the design, manufacture and use of efficient, effective, safe and more environmentally benign chemical products and processes".

While there are some differences in these definitions, for the most part they are focused on the design of chemicals and chemical processes that are inherently less

as design specifications, specifying and sourcing materials and products that incorporate green chemistry, changing manufacturing practices to substitute or reduce the use of hazardous chemicals in production, and developing and implementing policies restricting certain classes of chemicals or chemical risks in the products they make, source and/or sell.

Green chemistry may not be mainstream, but the avenues to get there are evolving

- Cross-sectoral, value chain collaboration is growing…
- Tools and metrics are evolving….
- Innovative new chemistries and materials are being developed…
- Education and awareness are changing…
- Understand that change is slow

A unique point in time to accelerate green chemistry

- Build incentives for R&D, adoption and scale
- Enhance green chemistry education
- Grow the scientific base
- Accelerate supply chain collaborative partnerships to solve problems
- Communicate the stories
- Transform the chemicals and materials economy
- Create a stronger, more vibrant, integrated green chemistry community

The GC3's next 10 years: The sky's the limit

There is no finish line

- Bill Bowerman

Roundtable desired outcomes

- Understand how the world has changed over the past 10 years and what this implies for mainstreaming green chemistry
- Understand challenges to accelerating green chemistry and concrete solutions overcoming them
- Understand how to effectively use partnerships to advance green chemistry
- Advance cross-sectoral dialogue around green chemistry and understanding among companies

Logistics

- Agenda
- Receptions
- Logistics
- Staff/Advisory Committee
- Evaluations

GC3 Advisory Committee

- Mary Grim, Timberland
- John Frazier, Nike
- Barbara Hanley, Hewlett Packard
- Bob Israel, Valspar
- Al Iannuzzi, Johnson & Johnson
- Rich Liroff, Investor Environmental Heath Network
- Roger McFadden, Staples
- Ken Zarker, Washington State Department of Ecology
- Al Innes, Minnesota Department of Pollution Control
- James Ewell, Blue Green Institute
- Bob Skoglund, 3M

Ground Rules

- Respectful, honest dialogue and listening
- Please keep electronic device use to a minimum (or outside)
- Chatham House Rule: Participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed

11th Annual Innovators Roundtable

Save the date!

May 2016

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GC3 GREEN CHEMISTRY & COMMERCE COUNCIL
Business Mainstreaming Green Chemistry