Questions or Comments?

Type them into the questions box!

"Why am I muted?"

Don’t worry. Everyone is muted except the Presenter and the Host. Thank you and enjoy the show.

Chat

Announcements and hyperlinks from our team
Let’s Get Social!

Follow the American Chemical Society on Twitter, Facebook, Instagram, and LinkedIn for the latest news, events, and connect with your colleagues across the Society.

Let’s Get Social!

Follow the American Chemical Society on Twitter, Facebook, Instagram, and LinkedIn for the latest news, events, and connect with your colleagues across the Society.

Contact ACS Webinars® at acswebinars@acs.org

Where is the Webinar Recording?

All Registrants
Watch the unedited recording linked in the Thank You Email for 24 hours.

ACS Members w/Premium Package
Visit the ACS Webinars® Library to watch the edited and captioned recording.
A Career Planning Tool For Chemical Scientists

ChemIDP is an Individual Development Plan designed specifically for graduate students and postdoctoral scholars in the chemical sciences. Through immersive, self-paced activities, users explore potential careers, determine specific skills needed for success, and develop plans to achieve professional goals. ChemIDP tracks user progress and input, providing tips and strategies to complete goals and guide career exploration.

https://chemidp.acs.org

Career Consultant Directory

Find a Career Consultant

• ACS Member-exclusive program that allows you to arrange a one-on-one appointment with a certified ACS Career Consultant.

• Consultants provide personalized career advice to ACS Members.

• Browse our Career Consultant roster and request your one-on-one appointment today!

www.acs.org/careerconsulting
If you are a student from a group underrepresented in the chemical sciences, we want to empower you to get your graduate degree!

The ACS Bridge Program offers:

• A FREE common application that will highlight your achievements to participating Bridge Departments
• Resources to help write competitive grad school applications and connect you with mentors, students, and industry partners!

Learn more and apply at www.acs.org/bridge
Email us at bridge@acs.org
“The ACS Scholars Program provided me with monetary support as well as a valuable network of peers and mentors who have transformed my life and will help me in my future endeavors. The program enabled me to achieve more than I could have ever dreamed. Thank you so much!”

ACS Scholar Adunoluwa Obisesan
BS, Massachusetts Institute of Technology, June 2021
(Chemical-biological Engineering, Computer Science & Molecular Biology)

GIVE TO THE
ACS SCHOLARS PROGRAM

Donate today at www.donate.acs.org/scholars

https://www.youtube.com/c/ACSReactions/videos
Looking for a new science podcast to listen to?

TINY MATTERS

Check out Tiny Matters, from the American Chemical Society.

Sam Jones, PhD
Science Writer & Exec Producer

Deboki Chakravarti, PhD
Science Writer & Co-Host

TO SUBSCRIBE
visit http://www.acs.org/tiny matters or scan this QR code

---

VOICES AND STORIES FROM THE WORLD OF CHEMISTRY

cen.acs.org/sections/stereo-chemistry-podcast.html
ACS Industry Member Programs

• ACS Industry Matters
  ACS member only content with exclusive insights from industry leaders to help you succeed in your career. #ACSIndustryMatters
  Preview Content: acs.org/indnl

• ACS Innovation Hub LinkedIn Group
  Connect, collaborate and stay informed about the trends leading chemical innovation.
  Join: bit.ly/ACSinnovationhub

ACS on Campus is the American Chemical Society’s initiative dedicated to helping students advance their education and careers.

acs.org/campus/acs
Advancing ACS’ Core Value of Diversity, Equity, Inclusion and Respect

Resources

Inclusivity Style Guide
A style guide for highlighting inclusivity in writing.

ACS Webinars on Diversity
Learning opportunities and resources on diversity.

ACS Publications DEIR Hub
Resources for diversity, equity, and inclusion in publishing.

ACS Volunteer and ACS Meetings Code of Conduct
Guidelines for inclusive behavior in all ACS meetings.

C&I Trainings
Educational opportunities for promoting diversity in the field.

NEW! Download DEIR Educational Resources
Additional educational materials for diversity and inclusion.

Quick Guide: Inclusion Moments
Tips on how to include diverse perspectives in everyday conversations.

Quick Guide: How to host an inclusive in-person event
Best practices for creating an inclusive environment.

Diversity, Equity, Inclusion, and Respect

Diversity**
The recognition and promotion of diverse groups in all aspects of the ACS community.

Equity**
Fairness, opportunity, and access to resources for all, with a focus on removing barriers for historically marginalized groups.

Inclusion**
Creating a culture of belonging by valuing and respecting all perspectives.

Respect
Respect for individual differences and the unique contributions of all ACS members.

https://www.acs.org/diversity

ACS SPRING 2023
Crossroads of Chemistry
MARCH 26-30 • Indianapolis, IN
#ACSSpring2023

https://www.acs.org/meetings/acs-meetings/spring-2023.html
Register Now! www.gcande.org

Register Today
Save up to $200 on Early Registration Pricing!

Register Now! www.gcande.org

ACS Webinars

www.acs.org/acswebinars

Next Week!

Thurs., March 9, 2023 | 2:00-3:15pm ET
Exosomes in Drug Delivery and Therapeutics
Co-produced with CAS, a division of the American Chemical Society

Register for Free

Browse the Upcoming Schedule at www.acs.org/acswebinars

Wed., March 15, 2023 | 2:00-3:00pm ET
Successful Transitions: Strategies for Adapting to a New Role
Co-produced with the ACS Younger Chemists Committee and the ACS Committee on Ethics

Thurs., March 16, 2023 | 2:00-3:00pm ET
Toxicology 101: Chemicals and their Toxic Effects
Co-produced with the ACS Office of Career and Professional Education
THIS ACS WEBINAR®
WILL BEGIN SHORTLY...

👋 Say hello in the questions window!

www.acs.org/acswebinars

Product Lifecycle Analysis at Scale: Measuring the Environmental Impact of Complex Products, Supply Chains, and Industries

PETER SALING, PhD
Director Sustainability Methods, BASF

MICHAEL OVERCASH, PhD, MS
Chief Executive Officer, Environmental Genome Initiative

JEFFREY WHITFORD, MBA
Head of Global Corporate Responsibility and Life Science Branding, MilliporeSigma

ALAN STEVEN, PhD
Chief Scientist, CatSci

This ACS Webinar ® is co-produced with the ACS Green Chemistry Institute.

www.acs.org/acswebinars

Download The Presentation Slides Under the Video Player

3/3/23

10
THE PCF GUIDELINE
A first-of-its-kind, tailored solution for calculating product carbon footprints in the chemical industry

Setting standards on the path to net-zero in chemical value chains

Mar. 2, 2023
Peter Saling (BASF)

About TfS
TfS is a joint sustainability initiative and global network of 40 chemical companies working to shape the future of the chemical supply chains.

Product Carbon Footprint Guideline publicly available on the TfS website from September 2022.

Global turnover
€500bn

Global spend
€300bn
Does the carbon footprint of chemicals matter?

With 6% of total contribution, the chemical industry is a large GHG emitter. In addition, chemicals products impact nearly all value chains

Over 95% of all manufactured goods rely on some form of industrial chemical process. Most industry sectors make use of chemical products, from energy generation and transportation, to information and communication technology (ICT) and construction.

Our way to net zero 2050

We are a key enabler in the net zero transformation of base chemicals and downstream value chains.

Globally, we want to reduce our absolute CO₂ emissions by 25% by 2030 compared with 2018. This means that, compared with 1990, we aim to reduce our global CO₂ emissions by 60% by 2030.

We aim to achieve net zero CO₂ emissions at BASF by 2050.

We are a front-runner in offering customers a portfolio of products with lower carbon footprints to enable their decarbonization.

Responsibility is ambition.

Decarbonization should be eventually driven by procurement and consumer behavior.

Take PCF as quantitative factor in purchasing decision

Take PCF as quantitative factor in consumer decision
Setting the stage: Determining the emission impact of consumer products requires data owned by actors along global value chains.

How to calculate a Product Carbon Footprint (PCF)?

- The PCF is an information of the climate impact of a product.
- It summarizes the total amount of greenhouse gas (GHG) emissions that is associated with a product depending on the system boundaries of the calculation.
- System boundaries may vary from cradle-to-gate to cradle-to-grave. TfS Guideline follows a cradle-to-gate approach.
The PCF guideline for the chemical sector

Harmonization is needed for calculation: the PCF Guideline by TfS

The gold standard for calculating chemical product carbon footprints (PCFs).

First-of-its-kind, industry-specific guidance on calculating chemical PCFs.

Empowers companies to produce higher quality carbon footprint data.

Tailored to meet unique challenges when calculating chemical PCFs.

Compliant with ISO and GHG Protocol accounting standards.

Allows comparison of chemical PCFs across companies.

Open source, “drop-in” solution available to other industries using chemical material.
**TfS PCF Guideline: A drop-in sectoral guideline**

- 95% of manufactured goods rely on some form of chemical processing.
- The chemical, plastics & process industry serves a huge number of downstream value chains.
- To avoid gaps in emission accounting, it is essential to have consistent ways to determine a PCF of chemical raw materials upstream, irrespectively of the application segment.
- Therefore, TfS positions its PCF Guideline for the chemical industry as a drop-in sectoral guideline to dovetail with downstream sectoral rule-books.
- The TfS PCF guideline is aligned with ISO and GHG Product Protocol as well as captured in the PACT program of WBCSD.

**Guideline structure: 5 practice oriented chapters**

- Introduction & corporate footprint
- 1. Introduction & corporate footprint
- 2. About the Guideline
- 3. Reporting principles
- 4. Specification for suppliers PCF calculation
- 5. Goal and Scope
  - 5.1 Goal and Scope
  - 5.2 Calculation Rules
    - 5.2.1 STEPS OF PCF CALCULATION
    - 5.2.2 TEMPORAL SCOPE
    - 5.2.3 CUT-OFF CRITERIA
    - 5.2.4 STANDARDS USED
    - 5.2.5 DATA TYPES AND SOURCES
    - 5.2.6 EMISSION FACTOR SOURCES
    - 5.2.7 LIFE CYCLE IMPACT ASSESSMENT 5.2.8 ACTIVITY DATA REQUIREMENTS
    - 5.2.9 MULTI-OUTPUT PROCESSES
    - 5.2.10 ADDITIONAL RULES & REG.
    - 5.2.11 DATA QUALITY & SHARE OF PRIMARY DATA
- 5.3 Verification and Reporting
- From generic approach to sector-specific PCF
**TfS PCF Guideline: Biogenic carbon**

- In alignment with ISO 14067, biogenic removals from CO$_2$ uptake during biomass growth shall be included in the PCF calculation (PCF, incl. biogenic CO$_2$ uptake).
- Additionally, all biogenic emissions (e.g., methane emissions from manure application) and further emissions from relevant processes (e.g., cultivation, production & harvesting of biomass) shall be included in the PCF calculation.
- Report also PCF excl. biogenic CO$_2$ uptake for alignment with current PEF and GHG Protocol requirements.
- Total carbon content and biogenic carbon content (BCC) to be reported alongside the PCF.
- Biogenic carbon content may be both due to physical presence in the product and due to attribution in biomass balance.

Note: 1. CO$_2$ biogenic removals and emissions not considered, but biogenic CH$_4$ biogenic emission included.

**TfS PCF Guideline: Material recycling**

- The impact of material recycling (e.g., chemical recycling, distillation of materials, mechanical recycling) to be included in the product lifecycle inventory and system boundary.
- If material recycling happens within the product system boundaries, the impact shall be included in the PCF of the product.
- If material recycling happens outside of the product system boundaries, 2 approaches can be followed. Selection to be reported.
  - Cut-off
  - Upstream System Expansion - USE (if alternative treatment directly replaces a final disposal and both options are known and well documented)
**TfS PCF Guideline:**
Defined list of data attributes (metadata) to be exchanged along between companies in the value chain.

Product Carbon Footprint Guideline publicly available on the TfS website from September 2022.

**Bringing transparency along the value chain**

**Neopentylglycol Pure with certified Net Zero PCF**
Thank you

Life Cycle Inventories – Approaches and Analytics

Dr. Michael Overcash
CEO

American Chemical Society
Green Chemistry Institute
March 2, 2023
www.environmentalgenome.org
mrovercash@earthlink.net
Environmental Genome - Objectives

1. Database to open the environmental sustainability window of global product decisions
   - An information source, not a tool to make decisions (Big Data – size of human genome)
   - It is analytics that translate the EG data to important software and community needs

2. Provide a comprehensive contribution to two major environmental impacts
   a) Global warming (carbon footprint) –global impact (net-zero effort)
   b) Chronic disease potential - prevention of 70% - 90% of chronic disease which is assessed by epidemiologist to be from environment of which multi-media environmental pollutants are significant.

   Impact –about 1 billion people globally and about 160 million in U.S. with chronic disease

Environmental sustainability is a more specific concept and boundaries

- The global standard for the measurement tool is referred to as life cycle analysis (LCA), for which there is a widely understood methodology (known as ground truth)

- The core data (life cycle inventory) quantify change. Transparency is now the key to acceptance.

- The environmental impacts are built from the core data and are at the choice of the organization’s priority values (metrics such as energy resource consumption, carbon or water footprint, human health, etc.)

- Rarely involves any economic parameters, like cost, profit, etc.

- Economic Input/Output methods have variations from ground truth of 200% -1,000% and so have proven to not meet quality standards for most life cycle studies.
How to manage the product and services issue?

- There are trillions of trillions global products
- The life cycle analysis results are a very significant factor in environmental sustainability, but are largely hidden or unknown quantification data for decision-making
- Most common statement in life cycle community, “We do not have the data”
- Breakthrough – virtually all the trillions of trillions of products are made with a small set of chemicals or materials – known as the chemicals-in-commerce and the life cycle inventory of these is known as the gate-to-gate.
- **100,000 chemicals made at 1 metric ton/year** – the essential ingredients in make any product
- Virtually no chemical stands alone, but is in the knot of supply chain (cradle-to-gate)

---

**Discovery sketch of the existence of an environmental genome of industrial products to mirror human genome as effects to human health (2001)**
Repeating environmental genome structures for three chemical manufactured from natural resources to completed chemical structure.
### Environmental Footprint Analysis And Circularity

Environmental Genome* data used to assess manufacturing process emissions across the supply chain.

*Polyethylene mapping method follows mass balance approach which has been identified by Ellen MacArthur Foundation as a key tool required to achieve circularity in advanced recycling.

---

### Environmental Genome Maps the 65 Germanium Chemicals-in-Commerce Into Products (critical electronic transistors, semiconductor, fluorescent bulbs, catalysts, optical equipment, wide-angle lenses)

---

### Periodic table displaying critical elements

Now we have the chemical database – connect to products

Environmental Genome unlocks the detailed manufacturing and emissions of complex products to seek environmental improvement and improve public health

THE ENVIRONMENTAL GENOME INITIATIVE
mrovercash@earthlink.net
www.environmentalgenome.org

Now we have the chemical database – connect to products
Environmental Sustainability Gains by Carpet Selection

- The look and feel of the carpet is the face fiber, often nylon.

- The connection to the floor is referred to as the backing and the two main choices are styrene butadiene latex and polyvinyl chloride layer.

- The Environmental Genome database was used to establish the fossil energy investment and the carbon footprint on a per square yard basis (for the same face fiber and style):
  - Polyvinyl chloride layer: 129 MJ natural resource energy/sq yd and 9.4 kg CO\textsubscript{2}eq/sq yd
  - Styrene butadiene latex: 63.5 MJ natural resource energy/sq m and 5.1 kg CO\textsubscript{2}eq/sq m

- For an average Software As A Service firm of 2,000 employees, 33,000 sq yd of flooring, the selection of the SBL backing provides an environmental energy savings of 2.2 million MJ and 158 tons CO\textsubscript{2}eq to the company sustainability scorecard, for the same style carpet – a product impact.

Healthcare Organizations and Environmental Sustainability

- A significant product decision can add to the carbon footprint improvement – the use of reusables instead of disposables.

- Textiles are one reusable category (surgical gowns, incontinence pads, isolation gowns, microfiber cleaning devices).

- One typical Raleigh, NC hospital (425 beds).

- The selection of reusables reduced their carbon footprint by 47 tons CO\textsubscript{2}eq per year, but also reduced annual cost for using these products by 40% - 50%. Additionally, a reduction of 90+% in landfill costs.
All these very diverse analytics depend on information in The Environmental Genome

This is innovative because no one has envisioned the power of creating an indexed environmental view of all industrial chemistry.

- **Industrial Competitiveness**
  - Increase competitiveness by fostering innovation in new chemicals
  - Rapid environmental scorecard for pollution prevention
  - Chemical discharges after catastrophic natural or manmade events

- **National Security**
  - Unauthorized production of cyber theft technology, e.g. stealth coatings
  - Undisclosed production of chemical weapons
  - National vulnerability to imports from different governments corporate patent violations

- **Product Design**
  - Quantify the environmental impact of chemicals, materials, colors, coatings, etc. in product design
  - Rapid environmental tools to match quick demands of product design

- **Public Health**
  - Environmental pollutant origins affecting nearly one billion people globally with chronic disease
  - Maternal and offspring health assessment to include environment
  - Quantifying environmental disparity

---

**Roles of Corporations and Foundations**

- Support the goals of building the quality EG environmental database for themselves and others
- Identify priorities in the chemicals-in-commerce for next stage in EG life cycle mapping
- Gain recognition for the corporate future vision of building the Environmental Genome
- Demonstrate important new sustainability direction for their future goals
- Participate in the EG Mapping Board
- Sponsor presentations or webinars for broader groups of practitioners actively involved in details of developing alternatives or decisions on environmental sustainability
- Provide technical and financial resources
Conclusions

- Product life cycle inventories can guide environmental sustainability progress, but also keep us away from adverse or unintended directions. These are the basis of Ecolabeling and our understanding of supply chains.

- All decisions for environmental sustainability should be measured – the concept of a common yardstick is strategic and reflects core values.

- Corporate participation in mapping the EG is expanding but others are encouraged to become involved in setting priorities, resources, and links to products.

Perspectives on the Environmental Genome

- “Advancing environmental health research offers us the best opportunity for preventing disease – because you can’t change your genes, but you can change your environment.”
  
  Director of the U.S. National Institute of Environment Health Science

- “The human genome is held in awe as it created each of us. The environmental genome of industrial products must be respected for it is what we as humans have truly created.”

  Royal Society of Chemistry, Green Chemistry Journal 2016
Jeffrey Whitford
Head of Sustainability and Social Business Innovation
Combating climate change
Renewable Energy & Reduce Emissions

Our 2030 goals

• Lower **direct greenhouse gas emissions** as well as **emissions from energy purchases** (Scope 1 and 2) by **50%** (2020 baseline).

• **80% of purchased electricity from renewable sources.**
  – 2020 baseline of **42%**

• Reduce **indirect greenhouse gas emissions** from the value chain (Scope 3) by 1,500 metric kilotons of CO₂ equivalents.

- **33% reduction in Scope 1 & 2 vs. 2020**
- **78% renewable electricity as of Dec ‘22**
Design for Sustainability (DfS)

New Product Development Process

Under DfS, the Product Development Process consists of three main steps:

1. **Brainstorm life cycle impacts, opportunities and customer voice**
2. **Assess and select target criteria**
3. **Develop the product and assess improvement**

→ **Greener Alternative Products**
Design for Sustainability: Greener Alternative Products

Stericup® E sterile filters

Sterile filtration – without the funnel.
Reduced plastic lab waste to meet customer feedback and reduce resource use
Same quality and performance with minimal changes to workflow

Up to 26% less plastic
Up to 20% less corrugated & plastic packaging

10.5 tons CO₂e saved in 2021*
FSC-certified corrugated packaging

* CO₂ equivalent savings compared to traditional Stericup

03
When everyone has access
Greener Products and Solutions
**DfS: Re-engineering**

Our re-engineering focus consists of two components:

1. **12 Principles of Green Chemistry**
   - We utilize the 12 Principles of Green Chemistry to re-engineer existing products and provide cutting-edge greener products and tools to customers.

2. **DOZN™**
   - Through this industry-first framework, we clarify what is “greener” about our re-engineered greener alternatives.

---

Design for Sustainability (DfS): Re-engineering
**DOZN™ In Action: β-Amylase**

β-Amylase—an enzyme commonly found in sweet potatoes—hydrolyzes starch into sugar.

- **6,000 lbs** of sweet potatoes
- **1,900 gallons** of acetone
- **Significant use** of electricity

**2,000 lbs** of sweet potatoes
**No organic solvent required**
**No additional electricity required**

to increase temperature and pressure

---

1 Paul T. Anastas and John C. Warner, 1991
Path Forward

Biorenewable Solvent Substitutions

Cyrene™—a bio-based, dipolar aprotic solvent that is a safer, more sustainable alternative for DMF and NMP—both of which are under increased regulatory restriction through REACH. Exclusively available from MilliporeSigma.

<table>
<thead>
<tr>
<th>Product</th>
<th>Biobased CO₂</th>
<th>Traditional CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyrene</td>
<td>1.4 kg CO₂/L</td>
<td>8.2 kg CO₂/L NMP</td>
</tr>
<tr>
<td>Acetone</td>
<td>1.77 kg CO₂/L</td>
<td>4.6 kg CO₂/L</td>
</tr>
<tr>
<td>Butanol</td>
<td>1.76 kg CO₂/L</td>
<td>4.6 kg CO₂/L</td>
</tr>
<tr>
<td>Ethanol</td>
<td>.52 kg CO₂/L</td>
<td>3.03 kg CO₂/L</td>
</tr>
</tbody>
</table>

Safer Solvents and Auxiliaries
The CO₂ footprint of Cyrene™ is 5x smaller than NMP.
Design for Sustainability (DfS): Re-Engineering

**DOZN™ 2.0**

**Customer Engagement Tool**

- Easy access to our quantitative green chemistry calculator for comparison against the 12 Principles of Green Chemistry

- Allow customers to score their own products and processes
- Provides flexibility to apply diverse product portfolio
- Utilizes readily available data
- Based in accepted industry practices
- Easy to access and free to use

• Launch the tool here: [www.sigmaaldrich.com/dozn](http://www.sigmaaldrich.com/dozn)

Greener Products and Solutions: Helping Customers Minimize Environmental Impacts 2023
Greener Products and Solutions
Education Advocacy

We’re increasing access to Green Chemistry education at higher education institutions worldwide, preparing the scientists of tomorrow by:

• Establishing safer lab procedures
• Instilling industry best-practices
• Reducing resource waste
• Answering to environmental challenges

Green Chemistry Education Partnership

BeyondBenign

Phase 1: Pilot
Phase 2: Strategic Planning
Phase 3: Scale Up & Global Expansion

2015 2020 2025

And beyond

TWENTY-SEVENTH ANNUAL
GREEN CHEMISTRY
& ENGINEERING
CONFERENCE
June 13-15, 2023 | Long Beach, CA & Hybrid

Closing the Loop:
Chemistry for a Sustainable Future

Register Today
Save up to $200 on Early Registration Pricing!

Register Now!
www.gcande.org
Expanding Access with GC&E Virtual Registration Scholarships

Scholarships are available for students, postdocs, and faculty who would not otherwise be able to attend the GC&E Conference, and who currently attend, work for, or are part of:

1. A Minority Serving Institution, (e.g., HBCUs, TCUs, PBIs, HSIs, AANAPISIs, NASNTIs, or AANHs – see list)
2. An institution in a country classified by the Word Bank as lower-middle-income or is in Central/South America or the Caribbean
3. An International ACS Student Chapter
4. A high school/secondary school

Accepted scholars will receive free access to attend the live virtual conference taking place June 13-15, 2023, in Pacific Daylight Time (GMT -8). Scholars may also present virtually if they are accepted into the program during abstract submission.

Register Now!  www.gcande.org

The ACS GCI Pharmaceutical Roundtable Presents

https://learning.acsgcipr.org

Learn how to apply green and sustainable methodologies in the synthesis of pharmaceuticals.

6 Modules
Academic & Industry Views
Videos & Tools
Self-Paced
Free

https://www.acsgcipr.org
THE LIVE Q&A IS ABOUT TO BEGIN!

Keep submitting your questions in the questions window!

ACS Green Chemistry Institute
Empowering people to reimagine chemistry and engineering for a sustainable future.

**Vision**
A sustainable future facilitated by the transforming power of chemistry and engineering.

**Mission**
To catalyze the implementation of innovative approaches to chemistry and engineering that enable sustainable development across the globe.

**Strategic Areas**

<table>
<thead>
<tr>
<th>Science</th>
<th>Education</th>
<th>Industry</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advance research, scholarship and innovation in green and sustainable chemistry and engineering</td>
<td>Enable the implementation of green chemistry and engineering across the education sector</td>
<td>Accelerate the industrial adoption of green and sustainable chemistry and engineering</td>
<td>Facilitate equity in the adoption of green chemistry, engineering, and sustainability practices worldwide</td>
</tr>
</tbody>
</table>

American Chemical Society

https://www.acs.org/greenchemistry
ACS Campaign for a Sustainable Future

SUMMITS: MOBILIZE CHEMISTS TO CONTRIBUTE TO SDG'S
GREEN AND SUSTAINABLE CHEMISTRY PLATFORM
SUSTAINABLE CHEMISTRY GRANTS PROGRAM

American Chemical Society

www.acs.org/sustainability

ACS Campaign for a Sustainable Future

www.acs.org/acswebinars

NEXT WEEK!

Thurs., March 9, 2023 | 2:00-3:15pm ET
Exosomes in Drug Delivery and Therapeutics
Co-produced with CAS, a division of the American Chemical Society

Register for Free

Browse the Upcoming Schedule at www.acs.org/acswebinars
Learn from the best and brightest minds in chemistry!

Hundreds of webinars on a wide range of topics relevant to chemistry professionals at all stages of their careers, presented by top experts in the chemical sciences and enterprise.

Edited Recordings
are an exclusive benefit for ACS Members with the Premium Package and can be accessed in the ACS Webinars® Library at www.acs.org/acswebinars

Live Broadcasts
of ACS Webinars® continue to be available free to the general public several times a week generally from 2-3pm ET. Visit www.acs.org/acswebinars to register* for upcoming webinars.

*Requires FREE ACS ID

ACS Webinars® does not endorse any products or services. The views expressed in this presentation are those of the presenter and do not necessarily reflect the views or policies of the American Chemical Society.

Contact ACS Webinars® at acswебinars@acs.org