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How has ACS Webinars benefited you?

ACS Chemistry for Life®

Open Access FREE Recording!

"From the Environment, Health and Safety perspective, this is great support for the principles we've been sharing with our researchers. I'm hoping my lab safety committee members were able to listen in to this ACS Webinar."

https://www.acs.org/content/acs/en/acs-webinars/professional-development/researcher-safety.html

Fan of the Week

Deborah Tew,
Interim Director, Environmental Health & Safety,
UNC Wilmington

Be a featured fan on an upcoming webinar! Write to us @ acswebinars@acs.org

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Check out the Archive!

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https://www.acs.org/content/acs/en/acs-webinars/videos.html

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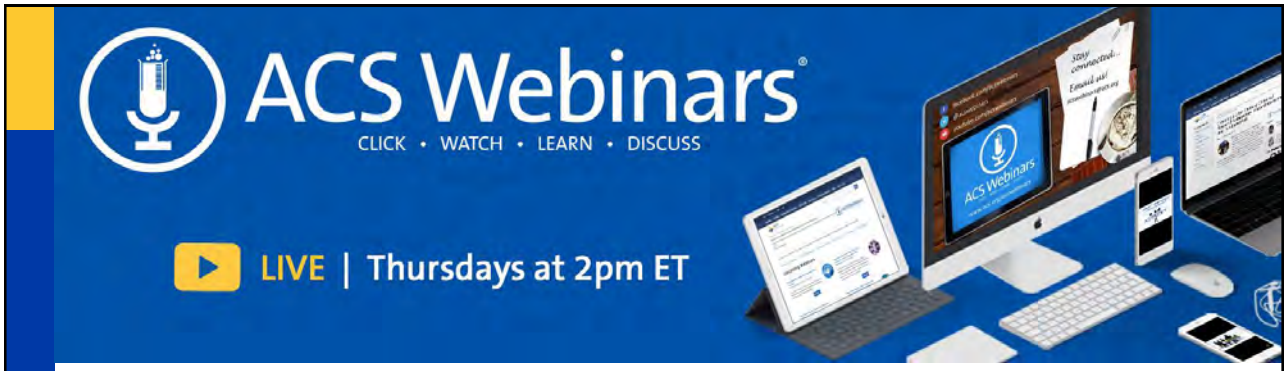

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What is ACS on Campus?

ACS Chemistry for Life®

ACS visits campuses across the world offering FREE seminars on how to be published, find a job, network and use essential tools like SciFinder. ACS on Campus presents seminars and workshops focused on how to:

ACS ON CAMPUS

- Publish in top journals
- Find a job
- Effectively use research tools like SciFinder® and ACS ChemWorx
- Communicate your science
- Write grant proposals
- Build industry partnerships
- Prepare for a changing employment landscape

http://acsoncampus.acs.org

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An individual development planning tool for you!

https://chemidp.acs.org

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Upcoming ACS Webinars!

www.acs.org/acswebinars

https://www.acs.org/content/acs/en/acs-webinars/spanish/fulerenos.html

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Upcoming ACS Webinars!

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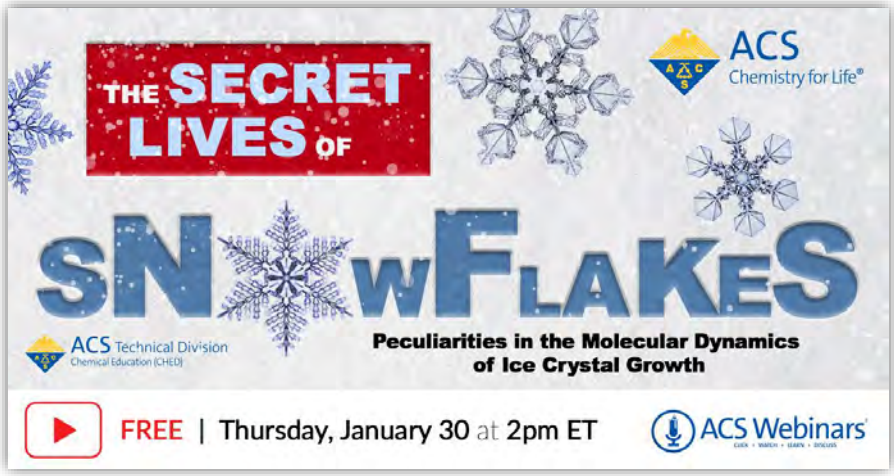

https://www.acs.org/content/acs/en/acs-webinars/popular-chemistry/snowcrystals.html

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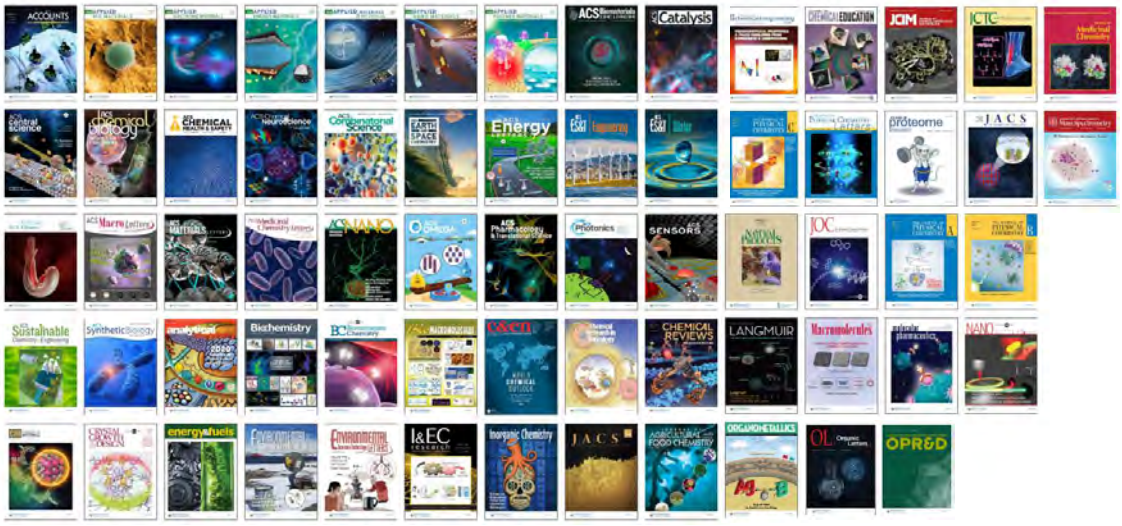
ACS Publications
Most Trusted. Most Cited. Most Read.

1,300,000 Research Articles / 100,000 News Stories / 35,000 Book Chapters / 1,000 References & Standards



https://pubs.acs.org

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Check out what ACS CHAS has to offer!

ACS Technical Division
Chemical Health & Safety (CHAS)

ROBIN IZZO,
2020 CHAS CHAIR

As Chair, each month, I will share updates and insights. More importantly, I want to hear from you on how CHAS can optimize effectiveness and impact. I invite you to participate fully in whatever way you can.

Share Ideas. Throughout the year, we will provide a number of ways for you to share:

- ***DCHAS Listserve***: Start a discussion on the listserve: DCHAS-L@princeton.edu.
- ***Idea Board***: Tell us what we are doing well, what we can improve, and what you want from DCHAS by posting to the DCHAS Idea Board at https://ideaboardz.com/for/DCHAS%20Strategic%20Ideas/3016245
- ***ACS Meetings***: Come to DCHAS meetings, programming, and the booth at the Expo.
- ***Call or Email***: Call or e-mail me directly at rmizzo@princeton.edu or 609-865-7156.

ACS National Meetings 2020
Philadelphia, PA, March 20-21
San Francisco, CA, August 14-15

http://dchas.org

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ACS CINF New Vision and Mission!

ACS Technical Division
Chemical Information (CINF)

JEREMY GARRITANO
2020 CINF CHAIR

The **ACS Division of Chemical Information (CINF)** is committed to promoting the generation of, access to, and use of the world's knowledgebase in chemistry and the related sciences

Vision: Better science through the power of chemical data, information, and knowledge

Mission: Prepare and empower the scientific community to create, analyze, organize, and disseminate chemical information and data.

https://acscinf.org

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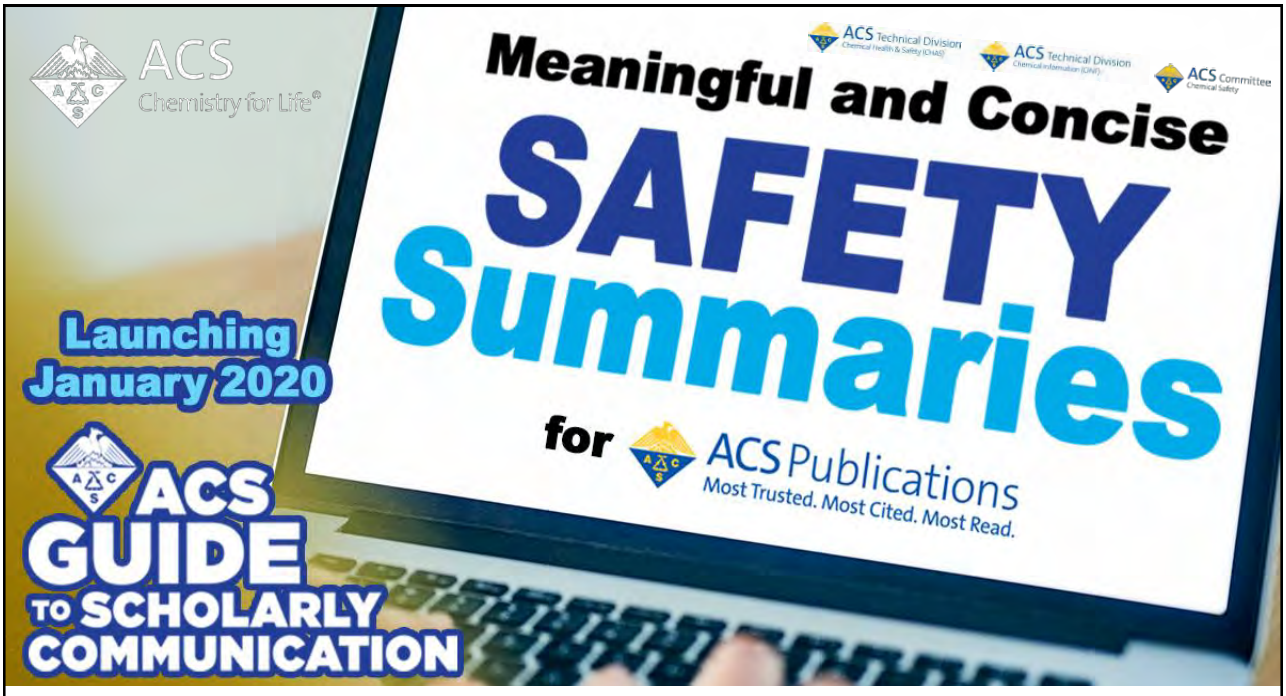

THIS ACS WEBINAR WILL BEGIN SHORTLY...

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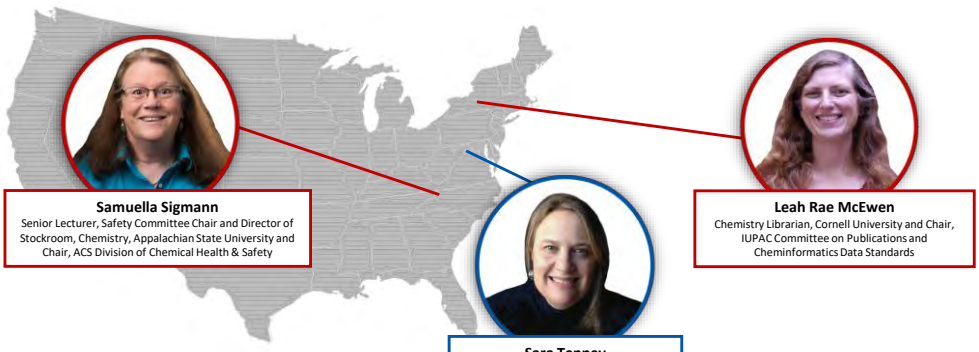
Meaningful and Concise Safety Summaries for ACS Publications



Samuella Sigmann
Senior Lecturer, Safety Committee Chair and Director of Stockroom, Chemistry, Appalachian State University and Chair, ACS Division of Chemical Health & Safety

Leah Rae McEwen
Chemistry Librarian, Cornell University and Chair, IUPAC Committee on Publications and Cheminformatics Data Standards

Sara Tenney
Publisher,
ACS Publications

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This ACS Webinar is co-produced with ACS Division of Chemical Health & Safety, ACS Committee of Chemical Safety, ACS Division of Chemical Information, and ACS Publications. 16

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Audience Survey Question

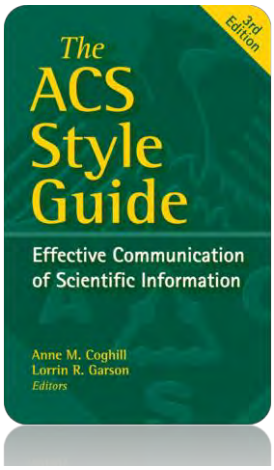
ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Do you currently include safety summaries in your publications?

- No, not currently
- No, but I would like to add them
- Yes
- Not applicable to my work

** If your answer differs greatly from the choices above tell us in the chat!*

Now in a Digital-First Format!



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Detailed Table of Contents

- PART 1: Scientific Communication +
- PART 2: Scientific Journals +
- PART 3: Data in the Google Era +
- PART 4: Scientific Style Conventions +
- PART 5: Editorial Style Conventions +

1.3 Communicating Safety Information NEW

- 1.3.1 Introduction
- 1.3.2 Safety Guidelines in Scientific Publications
- 1.3.3 Safety Summaries – Overview
- 1.3.4 Recognizing Hazards of Significant Concern
  - Assessing Risks
  - Minimizing Risks
  - Preparing for Emergencies
- 1.3.5 Formulating Safety Summary Statements
- 1.3.6 Example Safety Statements
  - Research Audience
  - Teaching Audience
- 1.3.7 Glossary of Safety Organizations & Concepts

*The fourth edition of The ACS Style Guide will include an **all new chapter** to provide authors with guidance on how to effectively communicate hazards and risks associated with published research.*

ACS GUIDE TO SCHOLARLY COMMUNICATION

https://pubs.acs.org/page/styleguide

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Chemistry Professionals

If you are an academic chemist in a wet lab, chances are you are ***experimenting with novel reactivity.***

You are pushing the boundaries and you are ***educating the next generation*** to advance chemistry.

How do you communicate to others in your lab and those building on your work what you learn about the potential hazards and risks working at the margins of your chemistry?

Texas Tech University Chemistry Lab Explosion 2010-01-07
CSB report and webinar 2011-10-19
https://www.csb.gov/texas-tech-university-chemistry-lab-explosion/

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Chemistry Professionals

Chemistry professionals have ethical and legal responsibility to work with chemicals safely.

They protect themselves, their communities, and the wider environment from the risks associated with the hazards of chemicals.

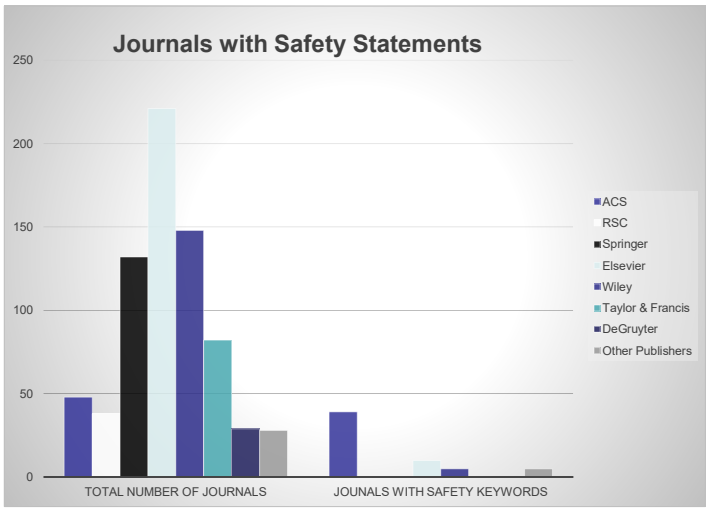
They address safety and health issues when contributing to the scientific literature.

Chemistry professionals need to develop competency in evaluating hazards, conducting assessments, and mitigating the risks of those hazards.

https://www.acs.org/content/acs/en/chemical-safety/workplace-and-industry.html

Adapted from Carol's Corporate Social Reponsibility (CSR), https://jcsr.springeropen.com/articles/10.1186/s40991-016-0004-6

Chemistry Professionals



- 2016 study examined inclusion of safety guidance for authors in chemistry journals
- Author guidelines surveyed for **726 chemistry journals** from **28 different publishers**
- **Only 8% of the journals surveyed included any one of four keywords in the author guidelines:**

caution, hazard, safety, danger

Grabowski, Goode; *J. Chem. Health Saf.* **2016.** DOI: 10.1016/j.jchas.2015.10.001.

Safety Timeline in Publications

Grabowski and Goode examine chemistry journals for safety precautions.

2016

2017

ACS Publications adds safety statement requirement for novel or significant hazards.

ACS Guide editors accept addition of chapter on Communicating Safety Information.

2019

ACS GUIDE TO SCHOLARLY COMMUNICATION

https://pubs.acs.org/page/styleguide

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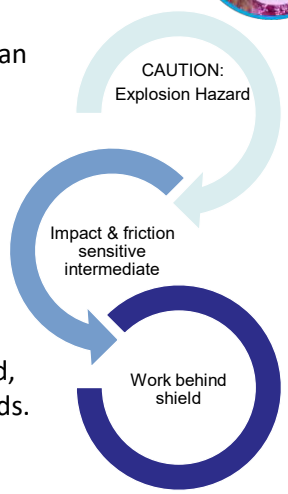
Safety in Scientific Publications…

- …will help organize and communicate safety information specific to an experimental method in a consistent manner appropriate to manuscripts.
- …should inform readers about hazards requiring caution beyond common laboratory safety measures.
- …are intended to help those reproducing experiments to understand, mitigate, and prepare for unusual or special risks in reported methods.



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Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

How do you currently manage hazards in your lab?

(select all answers that apply)

- Risk assessment
- Standard operating procedures
- Personal protective equipment
- Someone else manages my hazards
- Common sense

** If your answer differs greatly from the choices above tell us in the chat!*

ACS Technical Division Chemical Information (CINF) | ACS Technical Division Chemical Health & Safety (CHAS) | ACS Committee Chemical Safety | ACS Publications Most Trusted. Most Cited. Most Read.

Your Hazards & Risk

Risk Assessment in the Local Context

ACS GUIDE TO SCHOLARLY COMMUNICATION

https://pubs.acs.org/page/styleguide

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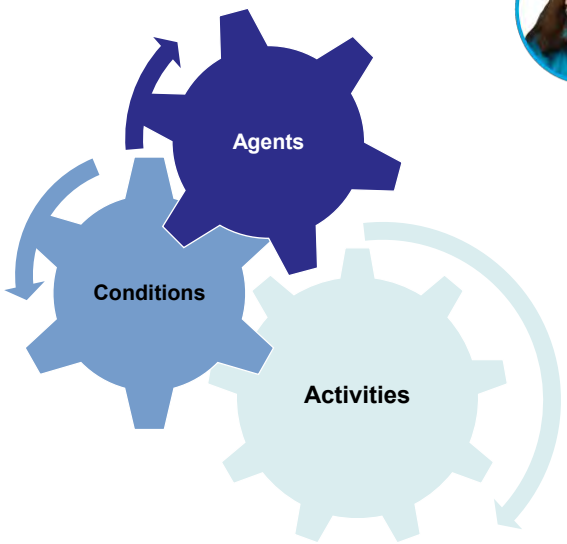
Determining Experimental Hazard

The information in a safety summary should address any type of hazard presenting significant risk based on assessment, be it due to:

- The chemicals
- The science
- The equipment or
- The environment where the work is being performed.



https://www.acs.org/content/acs/en/chemical-safety/hazard-assessment.html

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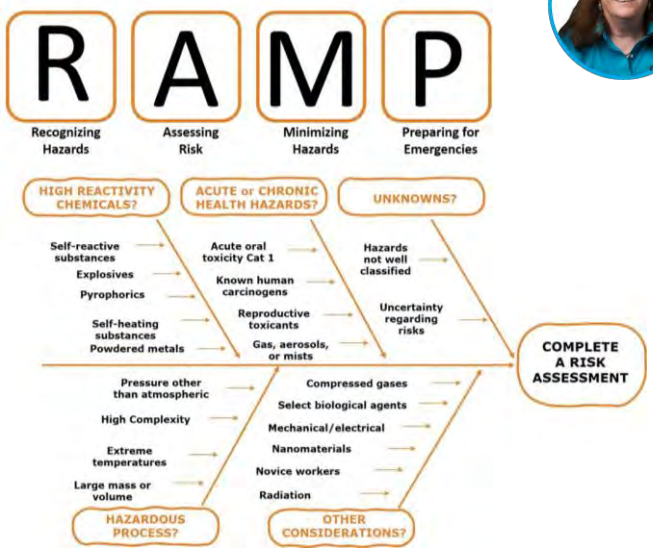
Determining Experimental Hazard

- **Recognize hazards** – Using available information from chemical labels, SDSs, documented procedures, experiential knowledge.
- **Assess risk** – Evaluate the hazards and potential for unwanted events using authoritative chemical properties and safety information.
- **Minimize risk** – Implement hazard prevention and risk management strategies into operating procedures.
- **Prepare for Emergencies** – Plan for contingencies to mitigate the effects of any exposure or damage that could occur.



Hill, R. H., Jr.; Finster, D. C. Laboratory Safety for Chemistry Students, 2nd ed.; Wiley: Hoboken, NJ, USA, 2016.
https://www.acs.org/content/acs/en/chemical-safety/basics.html

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Recognizing Chemical Hazards

GHS Symbol	Hazard Class	Hazard Description
	Explosive	Substances (Div. 1.1, Div. 1.2, Div. 1.3) which have an explosion hazard, whether mass or projection. (H201,H202, H203)
	Self-Reactive	Substances (Type A, B, or C) which can detonate, deflagrate, or self-heat under storage or handling conditions. (H240, H241, H242)
	Flammable	Category 1 substances (gases, aerosols, liquids, or solids) which are readily ignitable under the reaction conditions. (H220, H222, H224, H228)
	Pyrophoric	Category 1 substances (liquids or solids) which ignite upon contact with air. (H250)
	Self-Heating	Category 1 substances which self-heat sufficiently to ignite. (H251)
	Organic Peroxide	Type A organic peroxides which, as stored or handled, can detonate or deflagrate rapidly. (H240)
	Acute Toxicity	Category 1 substances. Concentration varies in this category based on the route of entry. LD_{50} ≤ 50 mg/kg bodyweight (dermal) or LC_{50}≤ 100 ppmV; ≤ 0.5 mg/L; ≤ 0.05 mg/L (inhalation of gases, vapors, dusts & mists - respectively) (H310, H330)
	Respiratory Sensitizer	Category 1A substances which show a high frequency of occurrence for respiratory sensitization in humans based on testing and/or severity. (H334)
	Germ Cell Mutagenicity	Category 1A substances which have positive evidence from human epidemiological studies. (H340)
	Carcinogenicity	Known to, or presumed to have carcinogenic potential for humans based on human (1A) or animal evidence (1B). (H350)
	Reproductive Toxicity	Known to, or presumed to be a human reproductive toxicant based on human (1A) or animal evidence (1B). (H360)
	Specific Target Organ Toxicity (STOT), Single Exposure	Category 1 substances that have produced significant toxicity in humans based on reliable human or animal evidence. (H370)

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https://www.acs.org/content/acs/en/chemical-safety/basics/recognize-hazards.html

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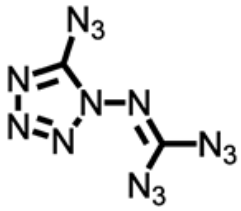
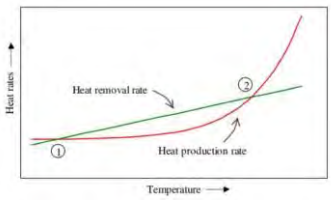
Consider Hazards From All Sources



https://blogs.sciencemag.org/pipeline/archives/2013/01/09/things_i_wont_work_with_azidoazide_azides_more_or_less

- Elevated pressure or temperature where apparatus or conditions could reasonably lead to a fire, explosion, or loss of containment.
- Oxygen at greater than 25% or oxygen/fuel mixtures which are ignitable.
- Compounds with a ratio of less than 6 carbons per energetic functional group (such as azide, diazo, nitro).
- Oxidations of organic molecules, particularly at elevated temperature and/or gram scale or greater.
- Processes with high exothermicity that could lead to a runaway reaction.
- Processes in which the energetics of scalability are insufficiently defined or require special cooling.
- Additional factors that can introduce complexity into the procedure (e.g., biological pathogens, radiation, nanoparticles).



https://www.slideshare.net/BobvanWoezik/b-van-woezikrunaway-and-thermally-safe-operation-of-a-nitric-acid-oxidation-in-a-semibatch-reactor

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https://www.acs.org/content/acs/en/chemical-safety/basics/assess-risks.html

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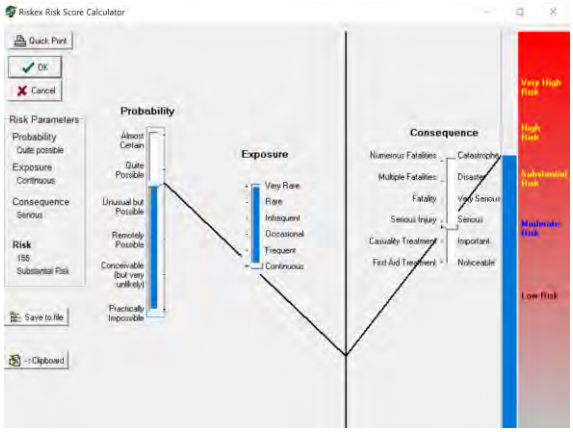
Assessing Risk in Local Context

Likelihood	Consequence: Insignificant	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	Extreme	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

https://safety.unimelb.edu.au/incident-reporting/incident-reporting-risk-matrix



https://safetyrisk.net/download-page/?dlm-dp-dl=40084

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https://www.acs.org/content/acs/en/chemical-safety/hazard-assessment.html

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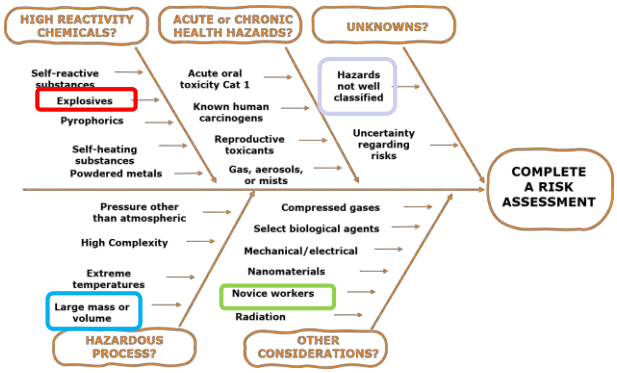
Example – Texas Tech University, 2010 Incident



Likelihood	Consequence: Insignificant	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	Extreme	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

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https://www.acs.org/content/acs/en/chemical-safety/hazard-assessment.html

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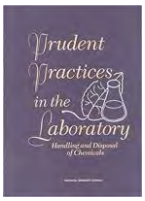
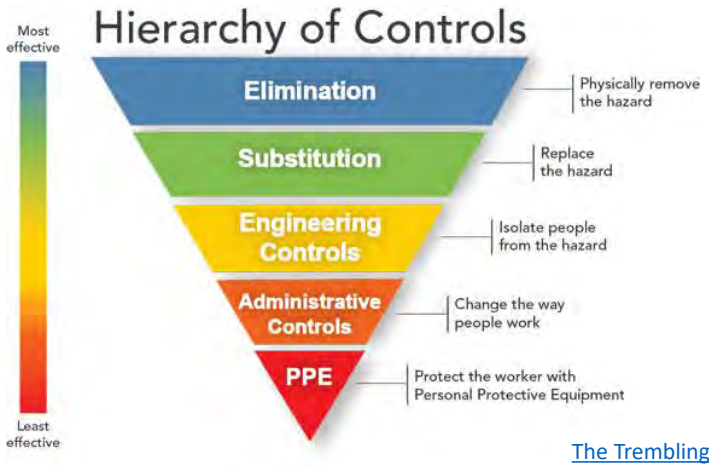
Selected Resources



- **ACS Chemical and Laboratory Safety** – (*Safety in Academic Chemistry Laboratories, Identifying and Evaluating Hazards in Research Laboratories*)
- **National Research Council** – *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards*
- **National Library of Medicine**, National Institutes of Health (*PubChem Laboratory Chemical Safety Summaries, ChemIDPlus Advanced*)
- **National Oceanic and Atmospheric Administration** – *Computer-Aided Management of Emergency Operations* (CAMEO)
- Urben, P. G. ***Handbook of Reactive Chemical Hazards,*** 8th Edition (2017)
- ***Not VooDoo X.4*** Alison Frontier, University of Rochester. Supported by a grant from the National Science Foundation, http://chem.chem.rochester.edu/~nvd/

https://www.acs.org/content/acs/en/chemical-safety/hazard-assessment.html

Minimizing Risk



The National Institute for Occupational Safety and Health (NIOSH), https://www.cdc.gov/niosh/topics/hierarchy/default.html

Example Control Strategies

- **Eliminate**: different methodology (e.g., ball milling vs. solvent-based extraction)
- **Substitution:** less hazardous solvent (e.g., lower flammability, lower toxicity)
- **Engineering:** fume hood, correct equipment (e.g., cannula transfer)
- **Administrative:** regular lab procedures (e.g., SOPs)
- **PPE:** correct gloves (based on chemical resistance*)

* https://eta-safety.lbl.gov/doc/vwr-glove-chemical-resistance-chart

The Trembling Edge of Science – Losing world-class chemist Karen Wetterhahn to mercury poisoning redrew the boundaries of safety and risk.

https://www.acs.org/content/acs/en/chemical-safety/basics/minimize-risks-of-hazards.html

Preparing for Emergencies

R	A	M	P
Recognize Hazards	Assess the Risks of Hazards	Minimize the Risks of Hazards	Prepare for Emergencies

- A risk assessment process can help zero in on places in the procedure where ***loss of control could result in significant danger*** and what mitigation options could be most effective in reducing chance of harm.

- Preparing for the potential of emergencies can provide ***direction and focus*** for appropriate response should unanticipated circumstances arise.

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https://www.acs.org/content/acs/en/chemical-safety/basics/prepare-for-emergencies.html

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RAMP Visual

ACS GUIDE TO SCHOLARLY COMMUNICATION

Sigmann, S. B. Playing with Fire: Chemical Safety Expertise Required. J. Chem. Ed. 2018 95 (10), 1736-1746 DOI: 10.1021/acs.jchemed.8b00152

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RAMP Example

RAMP	RECOGNIZE		ASSESS		MINIMIZE		PREPARE
Work steps and tasks	Chemical	Physical	Chemical	Physical	Work procedures	Personal protection	What-if analysis
Question Prompts	*•What chemicals are involved; what are their GHS hazard symbols; what are the associated hazard*	*•What glassware is involved; is there any electrical equipment involved;*	*•Do any of the chemicals have a flash point below the operating temperature of the experiment; do any of the*	*•Do you have to measure out anything from stock; do you have to dilute; do you have to transfer anything from*	*•What routes of exposure do I need to worry about (e.g., inhalation, skin); should I work in a fume hood to*	*•What types of gloves are appropriate for the toxicity hazards; do I need to wear a flame-resistant lab coat; will*	*•What if I spill some concentrated stock chemicals, how do I clean this up; What if I*
1 Obtain chromatography liquids	•Ethyl acetate has narcotic effects • Acetic acid is corrosive to eyes and skin; flammable; avoid inhalation	•Cuts from broken glass •Exposure from spills •Flammable solvents	Not required: Hazards are low and minimized in mixture and fume hood		•Use situational awareness and make sure aisles are clear •Pour in fume hood • Work on spill tray •Remove ignition sources	•Wear nitrile gloves and safety goggles for entire procedure; keep arms covered	•Use broom & dustpan to clean up broken glass •For a minor spill use absorbant to clean up spill •Nitrile gloves offer only minimal splash protection. Replace with splash or double glove.
2 Prepare chromatography chamber by adding four (4) mL of the mobile phase, 95% ethyl acetate and 5% acetic acid, to a beaker and cover with plastic wrap secured with rubber band.	Ethyl acetate is a highly flammable liquid and vapor, causes serious eye irritation, and may cause drowsiness or dizziness; acetic acid is a flammable liquid and vapor, causes sever skin burns and eye damage, and causes serious eye damage	•Cuts from broken glass •Exposure from spills •Flammable solvents	Not required: Hazards are low and minimized in mixture and fume hood		•Wear gloves and safety goggles; keep arms covered •Work in fume hood •Keep solvent from ignition sources •Work on spill tray		•Use broom & dustpan to clean up broken glass •For a minor spill use absorbant to clean up spill

https://www.acs.org/content/acs/en/chemical-safety/basics.html

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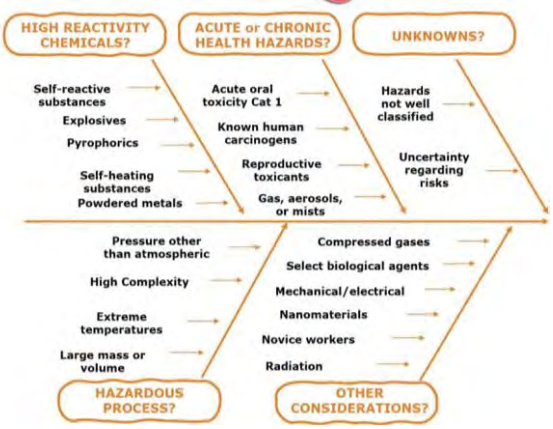
Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT

Do you have any of these "High Hazards" categories in your lab?

(select all answers that apply)

- High Reactivity Chemicals
- Acute or Chronic Health Hazards
- Unknowns
- Hazardous process
- Other considerations



** If your answer differs greatly from the choices above tell us in the chat!*

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Safety Summaries

Safety Summary General Information Checklist

Information to Include in a Safety Summary Statement (as Applicable)

- ☐ Names and CAS Registry Numbers of substances of notable hazard.
  - Include products, intermediates, solvents, catalysts, etc.
  - See categories listed in Table 1.3.2.
- ☐ GHS hazard communication elements for hazardous compounds noted.
  - Include symbol, signal word, hazard statement, code, and category.
- ☐ Note hazards of novel compounds.
  - Anticipate hazards based on those of closely related known analogues.
  - Assume highest precaution based on active functional groups.
- ☐ For the specific procedure used:
  - Note concentration of reagents.
  - Note scale of the experiment.
- ☐ Note specific laboratory apparatus used to safely handle particularly hazardous compounds.
- ☐ Note appropriate mitigation strategies required beyond basic PPE.
- ☐ Note appropriate emergency equipment needed beyond standard laboratory equipment.
- ☐ Note any modifications to laboratory equipment.
- ☐ Note additional laboratory or facility requirements required for specific hazards.
  - Note, for example, work with biohazardous or radioactive materials.

- Including the GHS hazard classifications helps index safety information about using these compounds in research
- External sources of reported toxicology or other safety information used to assess and manage risk for significant hazards should be cited
- A safety summary statement might also reference a specific procedure for handling highly reactive compounds.

Note Key Findings from Risk Assessment

- **Statements should emphasize both the hazard and risk mitigation.**

  Reaction 1 may undergo a thermal run-away. Synthesis apparatus should be placed behind a blast shield and temperature should be carefully monitored. A dry ice/propylene glycol slurry should be available for rapid, external quenching.

- **Quantity or the scale of the reported experiment should be considered in evaluating the risks.**

  This reaction has not been evaluated at a scale greater than 100 mg/batch. The exothermic nature of this reaction increases the fire risk and appropriate mitigation should be considered.

- **When appropriate, specialized emergency control equipment may be mentioned.**

  When using metal alkyls, have dry sand or powdered sodium bicarbonate immediately available for fire suppression.

- **Special maintenance requirements should be noted.**

  Serious fouling of the over-pressure relief valve necessitated cleaning the valve after every reaction.

Examples - Research

> Caution! tert-Butylithium is extremely pyrophoric and must not be allowed to come into contact with the atmosphere. This reagent should only be handled by individuals trained in its proper and safe use. It is recommended that transfers be carried out by using a 20-mL or smaller glass syringe filled to no more than 2/3 capacity, or by cannula. For a discussion of procedures for handling air-sensitive reagents, see Aldrich Technical Bulletin AL-134. [Note added August 2009].

Busacca, C. A.; Eriksson, M. C.; Haddad, N.; Han, S. H.; Lorenz, J. C.; Qu, B.; Zeng, X.; Senanayake, C. H. Practical Synthesis of Di-tert-Butyl-Phosphinoferrocene. *Org. Synth.* **2013**, *90*, 316-326. DOI: 10.15227/orgsyn.090.0316. http://www.orgsyn.org/demo.aspx?prep=v90p0316

Examples - Research

> Caution! Nickel carbonyl is a flammable, volatile (b.p. 43°), highly toxic reagent. Safety glasses, gloves, and an apron should be worn when handling this reagent and the first step of this preparation should be conducted in an efficient hood (Note 1).
>
> Note 1: The treatment for nickel carbonyl poisoning involves intramuscular injection of BAL (2,3-dimercapto-1-propanol).[1]

[1]P. G. Stecher, "The Merck Index," 8th ed., Merck and Co., Rahway, N.J., 1968, p. 372.

Semmelhack, M. F.; Helquist, P. M. Reaction of Aryl Halides with π-Allynickel Halides: Methallylbenzene. Org. Synth. 1972, 52, 115. DOI: 10.15227/orgsyn.052.0115. http://www.orgsyn.org/demo.aspx?prep=CV6P0722 (accessed Jan. 17, 2020).

Examples - Research

> ***DO NOT* store the resulting solution in a closed system, as pressure may build up** as a result of cyanate decomposition. Always check the compatibility of all constituents of the aqueous cyanide solution with H_2O_2.

De Knaep, A. G. M.; et al. Development Summary towards a Manufacturable Process for R 83842 [(S)-6-[(4-chlorophenyl) (1H-1,2,4-triazol-1-yl)methyl]-1-methyl-1H-benzotriazole]. Org. Process Res. Dev. 2000, 4, 162-166. DOI: 10.1021/op990081n. https://pubs.acs.org/doi/10.1021/op990081n (accessed Jan. 17, 2020).

Examples - Teaching Audience

> *p*-Xylene (CAS RN 106-42-3) has known reproductive effects, but there is *inadequate evidence for human carcinogenicity*.[1] This solvent has GHS warnings for skin and eye irritation. *Nitrile gloves offer sufficient prot*ection for splash hazard.[2] *p*-Xylene is a respiratory tract and aspiration hazard and so the solvent *should be poured in a fume hood*.[1] The *solvent is flammable*. Tabletop hoods at workstations add an additional control for these hazards. *p*-Xylene solutions must be *collected as hazardous waste*.

1p-Xylene; National Center for Biotechnology Information. PubChem Database. P-Xylene, CID=7809, https://pubchem.ncbi.nlm.nih.gov/compound/P-Xylene#datasheet=LCSS (accessed Jun. 27, 2019).

2p-Xylene; SDS Product No. 95680, ver. 3.11; Sigma Aldrich: Saint Louis, MO, November 10, 2018. https://www.sigmaaldrich.com/catalog/product/sial/95680?lang=en&region=US (accessed Jan. 31, 2019).

Make it Part of Your Research Process

Utilizing risk assessment streamlines the documentation process for preparing a safety summary. When risk assessment is incorporated into the experimental design, hazards are identified early and controls can be implemented efficiently to prevent undesired results. As with any area of work, better planning makes for better research.

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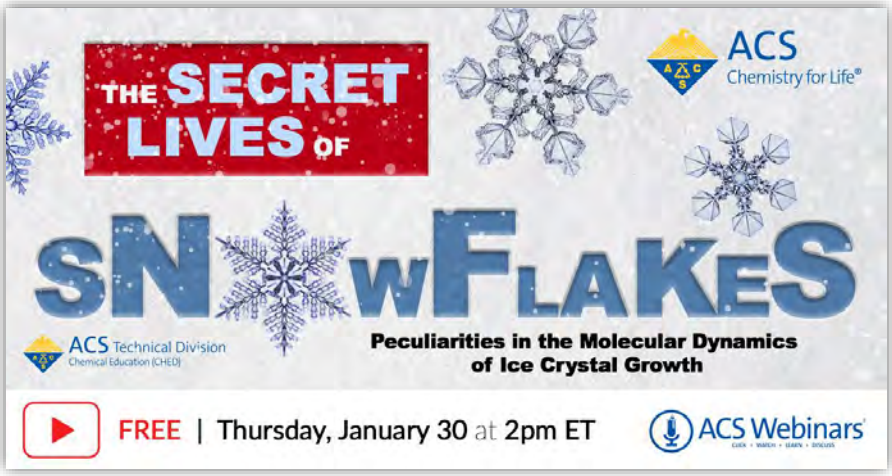

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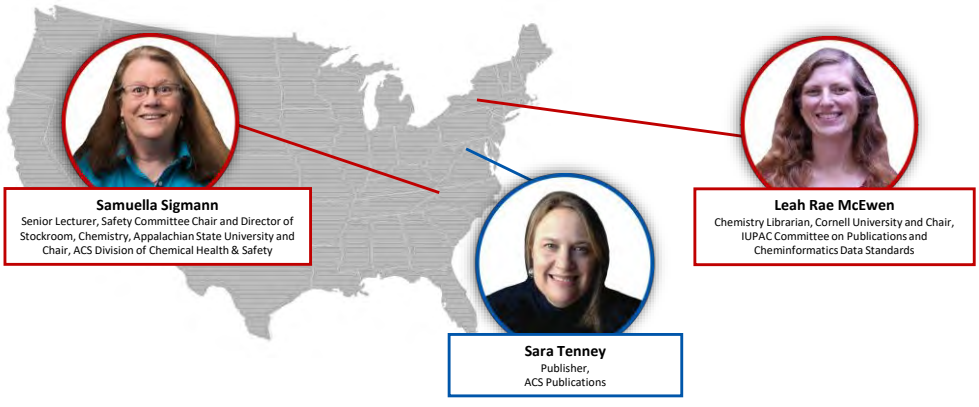

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