香港科技大學
THE HONG KONG
UNIVERSITY OF SCIENCE
AND TECHNOLOGY

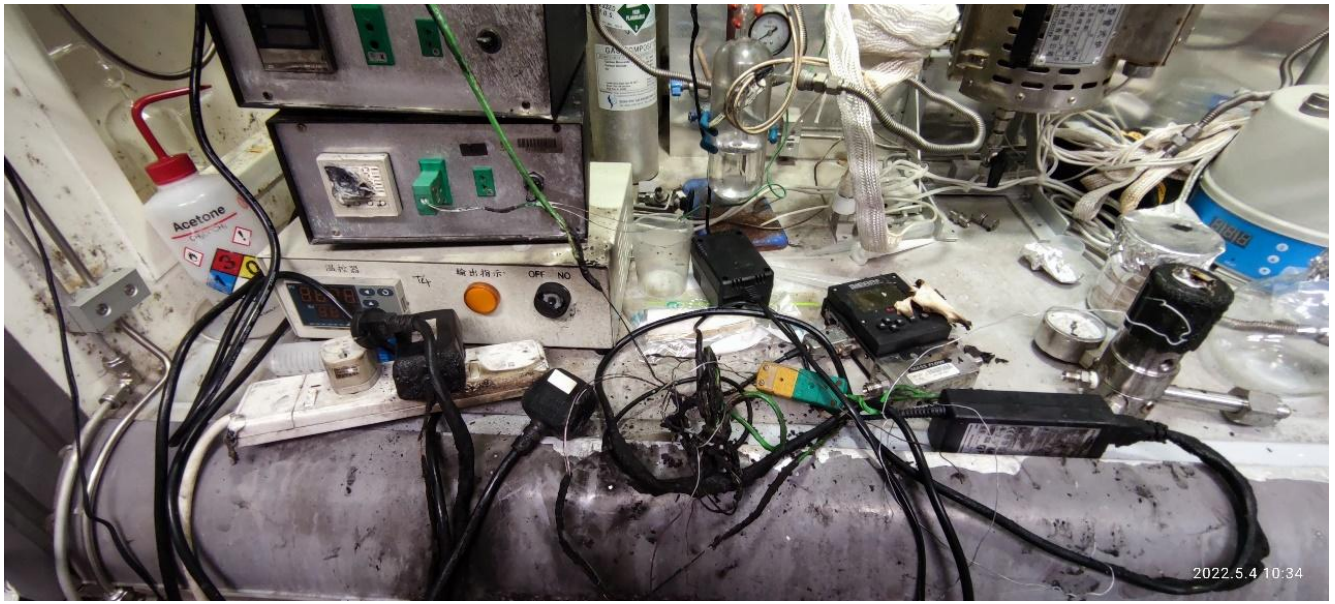
Consequences of Underestimating Risk of Hazards and Ignoring Safety in Researches

Fire incidents on 6/F Lab Building

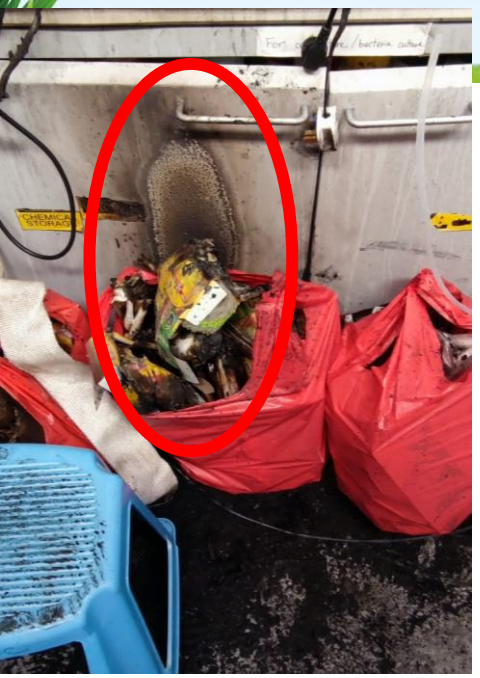
- Date: 30 April 2022
- Time: 22:35
- Location: 6/F research laboratory
- Incident details: A box of consumable items adjacent to a fume hood caught fire. The fire triggered the automated fire sprinkler system and was put out within 15-20 minutes
- Consequence: The lab was closed down for investigation

Fire incidents on 6/F Lab Building

- Possible cause: Short circuit of equipment ?
- MDMF checked burned wirings in the fume hood and found the wirings were burned from the outside and the insulation layers was intact, so the fire should not be caused by a short circuit



Fire incidents on 6/F Lab Building



Possible cause: Chemical fire ?

Glass bottles with unknown chemicals and plastic vials with novel materials were found in a box

Plastic vials contained novel materials with stable chemical ingredients

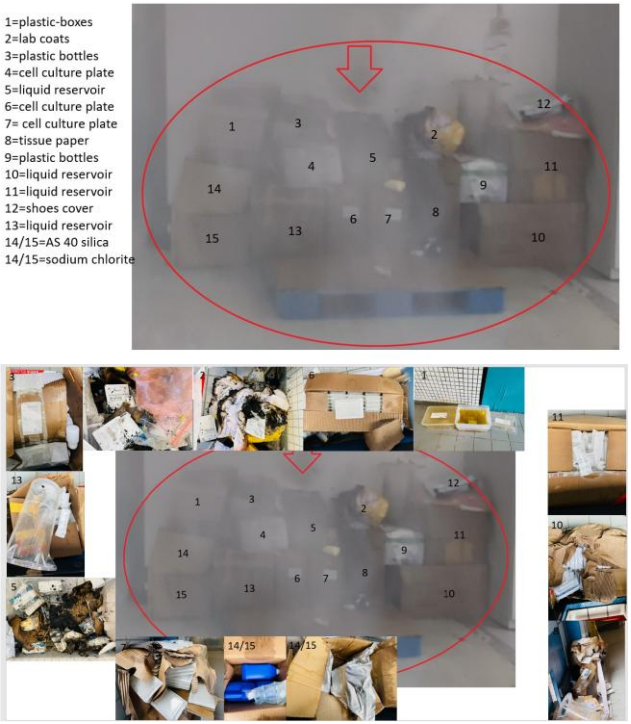
Requested researchers to provide SDS of each ingredient and experimental procedure for safety review

Fire incidents on 6/F Lab Building

Fire incidents on 6/F Lab Building

- Date: 13 May 2022
- Time: 15:45
- Location: 6/F corridor near lift 19
- Incident details: Self-ignition of unknown items and caused a fire

Fire incidents on 6/F Lab Building



Findings:

- Similar plastic vials with novel materials were found at the fire scene

Investigation - Flammability Tests

- Conducted flammability tests of each ingredient and novel materials




Four ingredients are not flammable even with combustible debris

Investigation - Flammability Tests

One ingredient with oxidizing properties and a freshly prepared novel materials with combustible debris burned but the fire was not sustained

Investigation - Flammability Tests

- Researchers reported that the lab had a high humidity problem
- HSEO tried to simulate preparing novel materials in a humid environment
- The novel materials wetted with water produces an exothermic reaction that slowly increases the temperature of the content of the plastic vial and causing fire



Lessons Learnt

- Novel materials possess unique chemical properties and the lack of information leads to uncertainty in risk governance—this is the nature of research, and it highlights the importance of risk assessment
- Any laboratory accidents or incidents might cause a significant consequence to a research team such as
  - Damage to the research laboratory and equipment
  - Closure of laboratory for investigation, clean up and insurance claim
  - Potential of personal injury
- Re-occurrence of laboratory accidents/incidents may mean higher insurance rates or lead to difficulty in obtaining insurance coverage

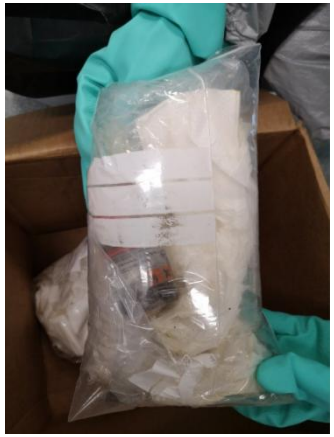
Fire

Fire

Fire

Overstuffed Fridge

- Tall, overstuffed fridge
- Researcher tried to reach the top shelve
- Two bottles fell off and broke (5-Chloro-1-pentyne)
- Inadequate cleanup
- Smell spread to other areas
- Emergency Ventilation activated by others
- Lab evacuated for 36 hours
- Response team took a long time to find the pieces.



Aqua Regia pour directly into a waste container

Poured Aqua Regia into a waste container

Safe method

- Use the smallest amount required for the operation
- Careful dilution at least 10x (bucket of ice)
- Compatibility test before disposal in a waste container
- Once neutralized, drain disposal is allowed

HF Injury March 2021

- PG student was trying to recap a bottle of HF/Pyridine
- He most likely wrapped the sealing tape the wrong way, causing the cap to spin open, spilling the content.

- HF burns on forearm, shoulder and neck

- Colleagues nearby help him wash the affected area at the tap

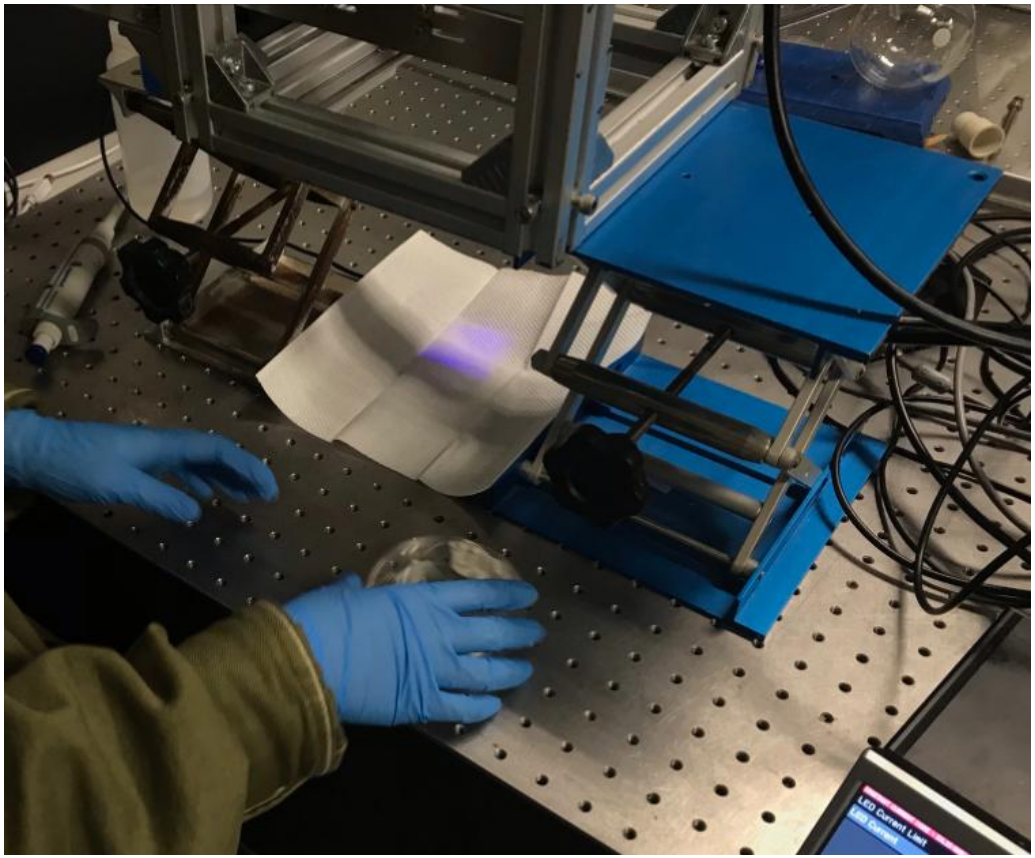
- Often underestimated. HF can cause severe, deep tissue burns. Fatalities due to lab accidents have happened in other countries.

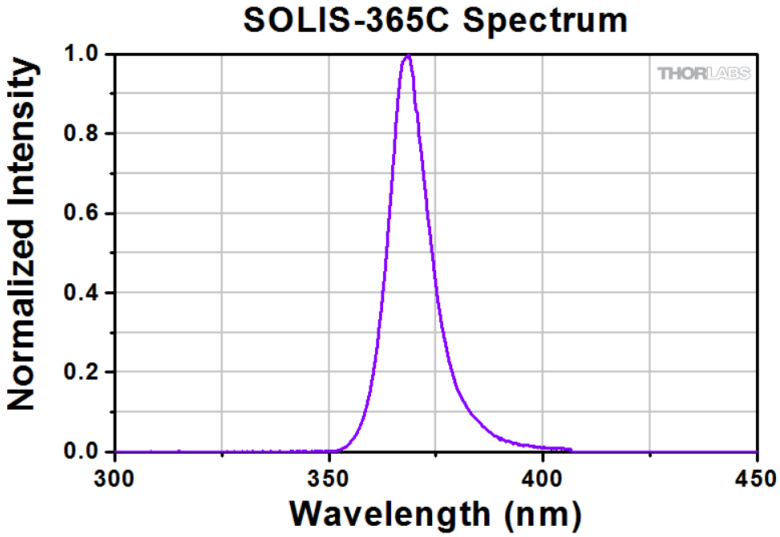
- If you work with HF, you must understand its hazard properties

25 May 2018

- A hydrothermal autoclave exploded inside an overheated furnace
- Fortunately, no one was injured

High intensity UV burn July 31, 2021

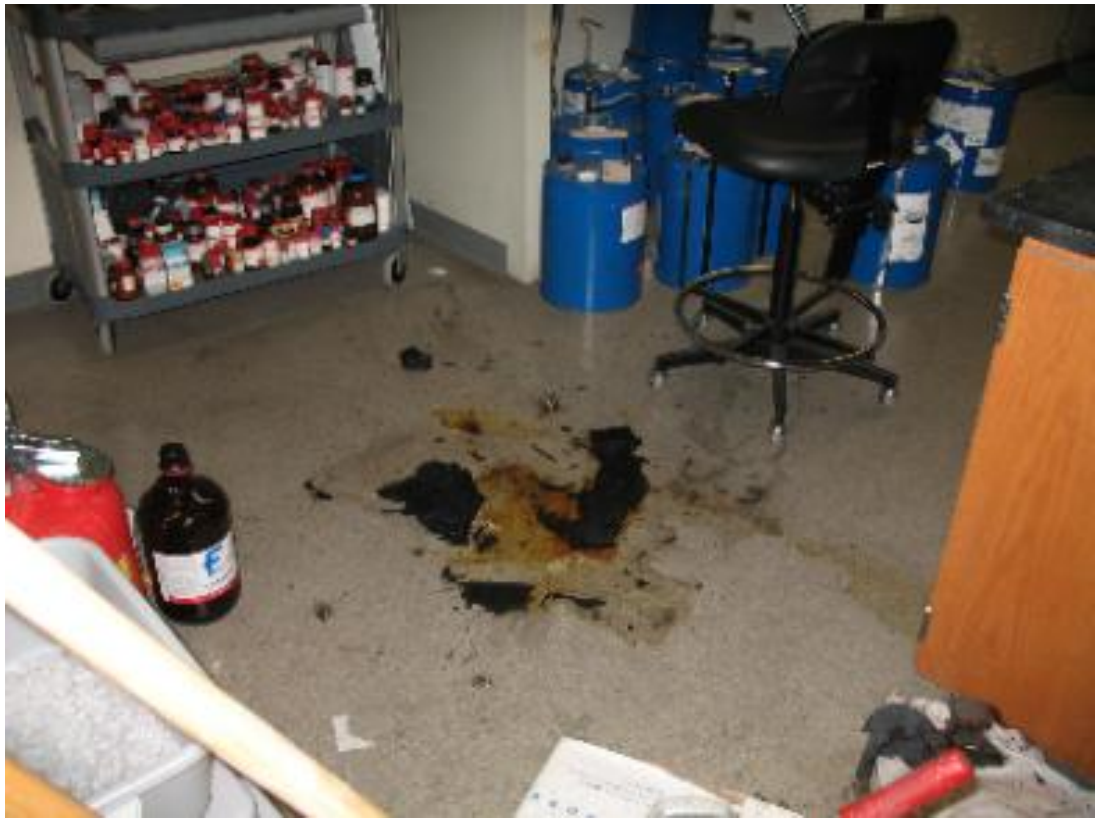


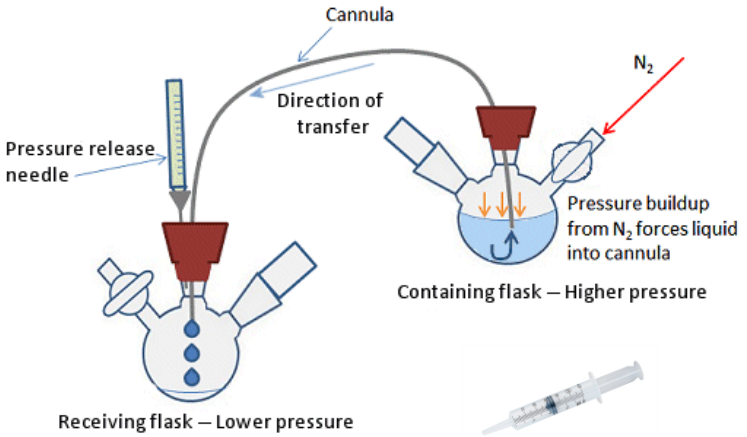


High intensity UV burn July 31, 2021

Serious Lab Accidents in Oversea Universities

RA died from burning accident at UCLA, 2008





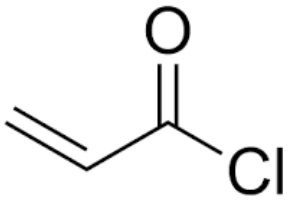
Spark from Pressure Gauge Caused University of Hawaii Explosion

- April 2016
- Mixture of hydrogen gas in a tank exploded
- Explosion caused by spark
- A Postdoc lost an arm in the accident

https://www.hawaii.edu/news/2016/07/01/independent-investigation-of-lab-accident-complete/

HKUST Fatal Lab Accident in April 1995

- An RA broke two reagent bottles, one of them contained acryloyl chloride, which generate irritating acidic fume
- Richard tried to warn others to leave, and unknowingly entered the lab where the spill occurred to wash his eyes
- He went to the hospital for check-up. The acid fume caused lung edema and he died the next day



Damages could be Far-reaching

- Felony violation of California Labor Law
  - failure to correct unsafe conditions,
  - failure to require appropriate work clothing
  - failure to provide chemical safety training
- UCLA fined for ~1 M USD
- Harran paid US$10,000 to the burns unit where the RA was treated
- Conduct 800 hours of non-teaching community service, including teaching lab-safety to underprivileged high school students and speaking to incoming UCLA students about the importance of lab safety

Safetywise

Safetywise - HSEO Newsletter
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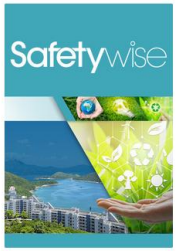


May 2019

Jul 2018

Mar 2018

MISSION

To promote and support health, safety and environmental protection in teaching, research, and other activities at HKUST.

VISION

We sustain a healthy, safe and environmentally friendly culture at the HKUST campus, and our graduates bring forth the same into the wider society with pride.

VALUES

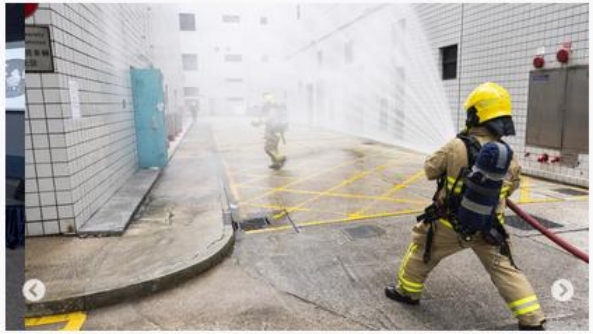
We care about the well-being of our campus community and put Health, Safety and Environment (HSE) at the heart of everything we do.

We perform our duties with professionalism and integrity.

We take the lead in proactive and preventive management of HSE risks.

We strive to advance our knowledge and expertise to face novel challenges and support cross-cutting solutions.

Eng 粵語 普通话



- AED location
- Laboratory Portal
- Workplace Heat Stress Risk Assessment
- Use of Portable Computers and Work From Home Ergonomics Self-Assessment Checklist
- Heads and DSO Meeting 27 Nov 2024 (Internal access only)
- List of DSOs (Internal access only)
- HSEO Field Team Organization Chart (Internal access only)
- Requirements for hazardous operations

https://hseo.hkust.edu.hk/

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Safety is Everyone's Responsibility

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THE END