

# Lesson learn



## Refrigerator accidents sharing

Nov. 2021

### 1、 Case sharing

In recent years, a large number of universities and research labs have used ordinary refrigerators without explosion-proof devices to store various types of organic solvents and have caused numerous refrigerator explosions.

#### Refrigerator accidents in domestic university laboratories:

- CASE 1:

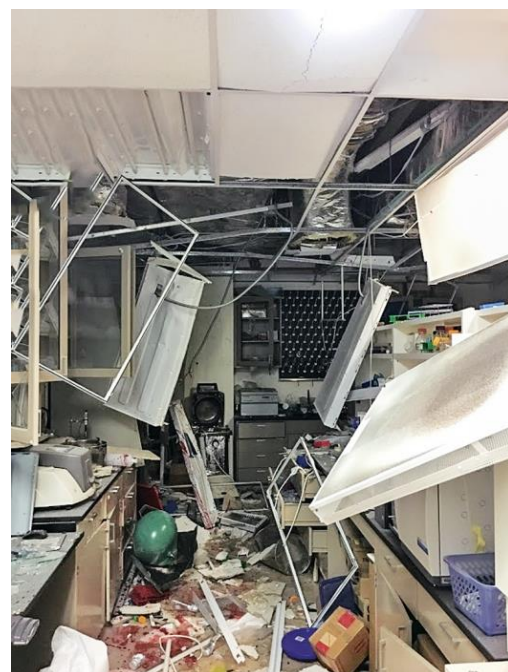
April 11<sup>th</sup>, 2004

An explosion was caused by a mechanical temperature-controlled refrigerator storing chemical reagents in a laboratory in the chemical department building of a university in Zhejiang Province, as a result of a micro-leak of chemical reagents and an electrical spark from the start of the mechanical temperature-controlled refrigerator.

- CASE 2:

March 15<sup>th</sup>, 2006

An explosion occurred in a laboratory in the chemistry building of a university in Shanghai. The reason for this accident is that a mixture of gases dispersed in the air may have reacted with the refrigeration facilities of a refrigerator placed in the test case (flammable chemical vapor leaked and came into contact with the electricity inside the refrigerator), causing the refrigerator to explode.



- CASE 3:

Mid-December 2009

A refrigerator exploded and caught fire in the chemistry laboratory of an academician at a university in China, but fortunately, the fire was put out in time and did not cause any major damage. It was later found that this was due to the age of the laboratory refrigerator, after the failure of the circuit, causing the explosion of flammable solvents in the refrigerator.

- CASE 4:

Jan 10<sup>th</sup> , 2016

A refrigerator with organic chemical reagents in a chemistry laboratory in the Science and Technology Building of Beijing University of Chemical Technology caught fire, with open flames and black smoke at the scene

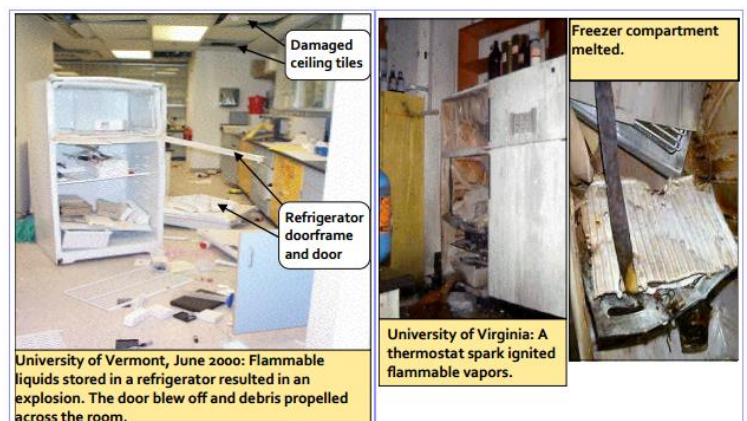
### Laboratory Refrigerator Accidents in Foreign Universities :

- CASE 1:

A laboratory refrigerator explosion occurred at the University of California, UCSB, many years ago. An ordinary refrigerator in the laboratory was suspected to contain flammable and explosive volatile chemicals, and the

explosive mixture reached the lower explosive limit in the confined space of the refrigerator when a weak electrical spark from a light turned on inside the refrigerator during the opening and closing of the refrigerator door ignited the flammable gas inside the refrigerator.

- Case 2:



An explosion and fire occurred in a university laboratory abroad due to a small amount of flammable chemicals such as alcohol/ethanol that were temporarily stored in a non-explosion-proof refrigerator. The laboratory staff had placed the flammable solution in a refrigerator in another laboratory at the time as they were doing cleaning in their own laboratory and assumed it was safe. Fortunately, no one was in the laboratory at the time of the explosion.

The explosion, fire and smoke caused damage of up to US\$200,000 and the laboratory had to be shut down during clean-up and renovation

- Case 3

An explosion suddenly occurred in a laboratory in the new building of an organic chemistry institute, shattering the window glass of the room. With the sound of the explosion, smoke and fire rose from the room. The laboratory contained a variety of toxic and dangerous substances, and the explosion damaged the containers, filling the room with toxic gases and spilling toxic liquids, making it difficult for firefighters to get to them. Firefighters wearing oxygen masks later arrived and fought for nearly an hour to extinguish the fire.

The cause of the accident was that the laboratory staff were doing chemistry experiments during the day and when they left the laboratory at 5.40 pm, they put the vial with 200mL of petroleum ether left in the refrigerator without a cap, thus causing an explosion.

Case 4



A medical university animal center biochemistry room refrigerator suddenly exploded, the cause of this accident, the investigation is due to research staff will be 10 bottles of ether containing the triangular flask into the refrigerator, and the mouth of the bottle did not add a sealing plug, resulting in a large amount of flammable gas volatilization, when the refrigerator work with electric sparks and caused an explosion, fortunately did not cause casualties

## 2、Cautions

- Laboratory refrigerator/freezer: for storage of common solvents and non-flammable and explosive substances only.
- Laboratory explosion-proof refrigerators/freezers: for storing flammable and explosive substances.
- Zhongshan University and Fudan University have both issued notices to laboratories in 2020 and 2021 requiring that chemicals with volatile flammable and explosive vapors that require refrigeration must be stored in explosion-proof refrigerators.
- Harvard University, USA and the University of Washington recommend storing chemicals with a closed cup flash point below 38°C in explosion-proof refrigerators or freezers.

Chemicals	Flash point (°C)	Chemicals	Flash point (°C)
化学品	闪点	化学品	闪点
Acetone	-18	Petroleum ether	< -20
Benzene	-11	Tetrahydrofuran	-14.5
Toluene	4	Triethylamine	-17
Ether	-45	Hexane	-18

一定要牢记：拒绝侥幸，别怕麻烦。

*Nothing we do is worth getting hurt for !*