Chemicals Safety Management

Chemicals Safety Management

EHS

Potential consequences of chemicals not being properly managed:



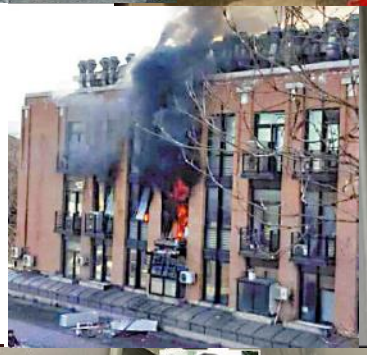


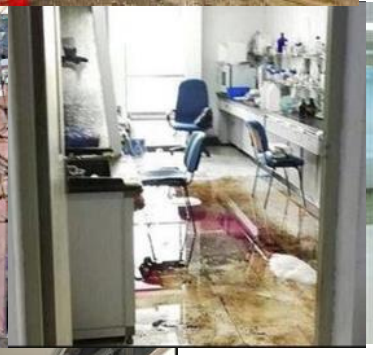

Domestic and foreign university laboratory accidents

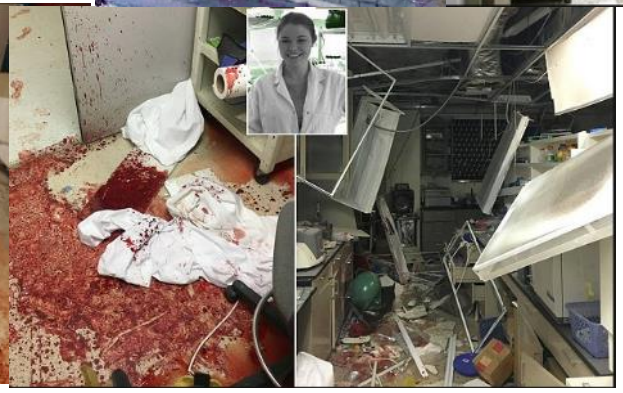
EHS

Strategy:
Design and layout

Management:
Chemicals management







Technology:
Violation of operations

Case 1: 2018-12-26 Beijing Jiaotong University waste explosion Three graduate students died
Case 2: A female researcher dies at the University of California laboratory explosion in 2015
Case 3: 2015-12-18 Tsinghua University explosion caused a postdoctoral death and burned three laboratories
Case 4: 2016-3-16 The University of Hawaii laboratory explosion caused a loss of one arm and the school was fined a million fines.

Domestic and foreign university laboratory accidents

EHS

At 9:34 am on December 26, 2018, an explosion occurred in a laboratory at Building 2 of the East Campus of Beijing Jiaotong University. The accident caused a total of three students who participated in the experiment to die, and the site was over 60 square meters.

Background: Lab Incidents in Universities of China

No.	Incident time	Incident brief introduction	Result
1.	2019-03-27 19:00	A lab explosion happened in Fudan University of Shanghai	1 student got serious injury and lab got burned
2.	2018-12-26 09:30	An explosion occurred in the environmental engineering lab of Beijing Jiaotong University during handling waste	This case caused 3 graduate students' fatality
3.	2018-11-11 10:00	An explosion occurred in a lab of Hanlin College of Nanjing University of Traditional Chinese Medicine	Several students got burned
4.	2016-09-21	An explosion happened in a chemical and biological lab at the Songjiang campus of Donghua University	This case caused 3 graduate students injury
5.	2016-1-10 12:00	A fire broke out in a lab in the science and technology building of Beijing University of Chemical Technology	The lab got burned
6.	2015-12-18 10:00	An explosion occurred in the chemistry lab of Tsinghua University	One doctoral candidate died in this case
7.	2015-06-17 16:30	Lithium exploded in a lab on the 2nd floor of the physics building of Suzhou University	The lab got burned
8.	2015-04-05 noontime	An explosion hit a lab at the College of Chemical Engineering, China University of Mining and Technology in Xuzhou of Jiangsu province	This case caused 1 dead and 5 seriously injured
9.	2014-12-04 11:00	A lab explosion at Changzhou Institute of Engineering in Jiangsu province	The lab got burned
10.	2013-04-30 09:00	An explosion occurred in an abandoned laboratory at Nanjing University of Science and Technology during demolition work	This case caused 1 dead and 3 seriously injured
11.	2012-6-3 07:30	A fire broke out in a lab at Peking University	Two research labs got burned
12.	2012-3-6 18:00	A fire broke out in a lab building of Peking University medical center	One lab got burned
13.	2011-12-07 11:00	Tianjin Nankai University chemical lab accident	One female student suffered from serious hand injury
14.	2011-04-14 15:45	An explosion occurred in a lab of the Chemical Engineering Institute of Sichuan University at Jiangan campus	3 students got injured
15.	2009-10-23 13:00	An explosion happened in a lab of new building 5 at Beijing Institute of Technology)	The lab got burned, 5 students got injured
16.	2008-07-11 10:00	An explosion happened at lab 510, Yunnan Institute of Microbiology, Beiyuan, Yunnan University	One doctoral student got seriously injured

Current status of chemicals management in colleges and universities

EHS

1. The management rules and regulations are not perfect;
2. The control of the procurement process is not strict;
3. The storage management is relatively random and lacks rationality;
4. The warehouse does not meet the safety design standards;
5. Violation of lab safety guidelines.
6. Insufficient supply of emergency equipment;
7. Safety inspection and management are not in place;
8. Experimental staff's safety awareness is weak.

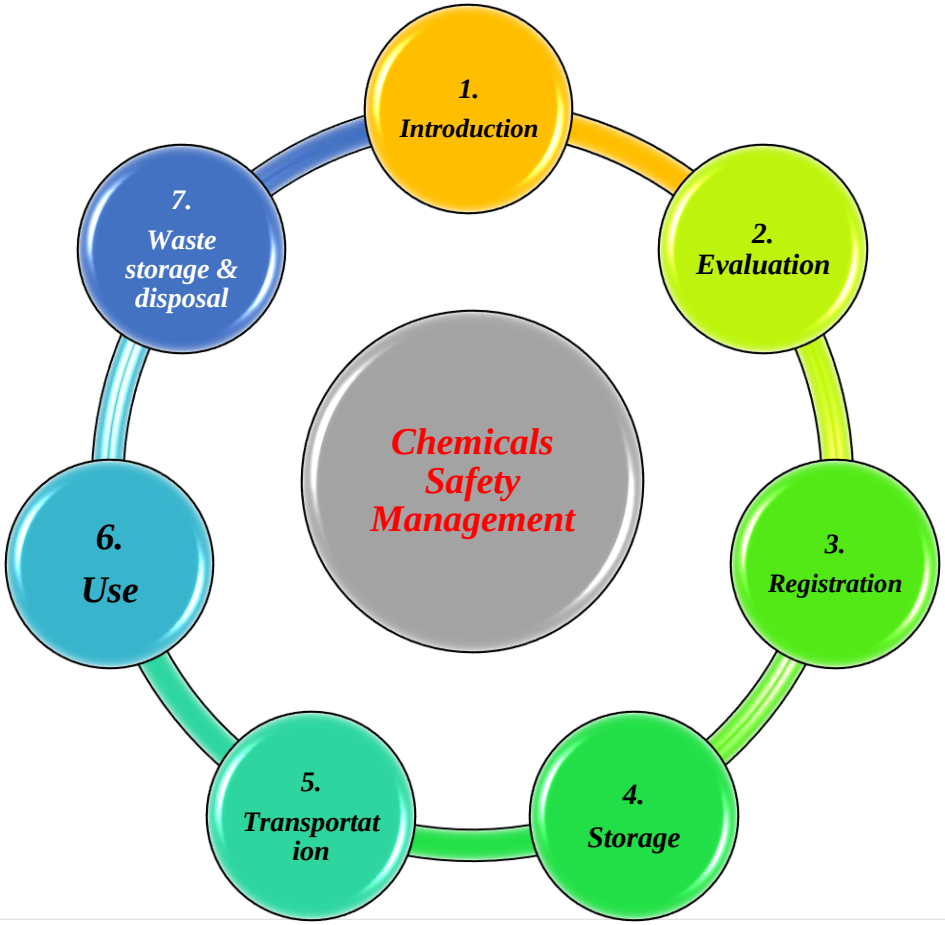
Countermeasures for Chemicals Management in Colleges and Universities

EHS

1. Optimize the management mechanism and improve the rules and regulations and operating procedures for chemicals management;
2. Establish a group for chemical safety management to implement safety supervision responsibilities;
3. Strengthen safety education and training;
4. Establish a safety management system for the entire life cycle of chemicals using information technology.

Chemicals Safety Management

Chemicals Safety Management——Full life cycle management:

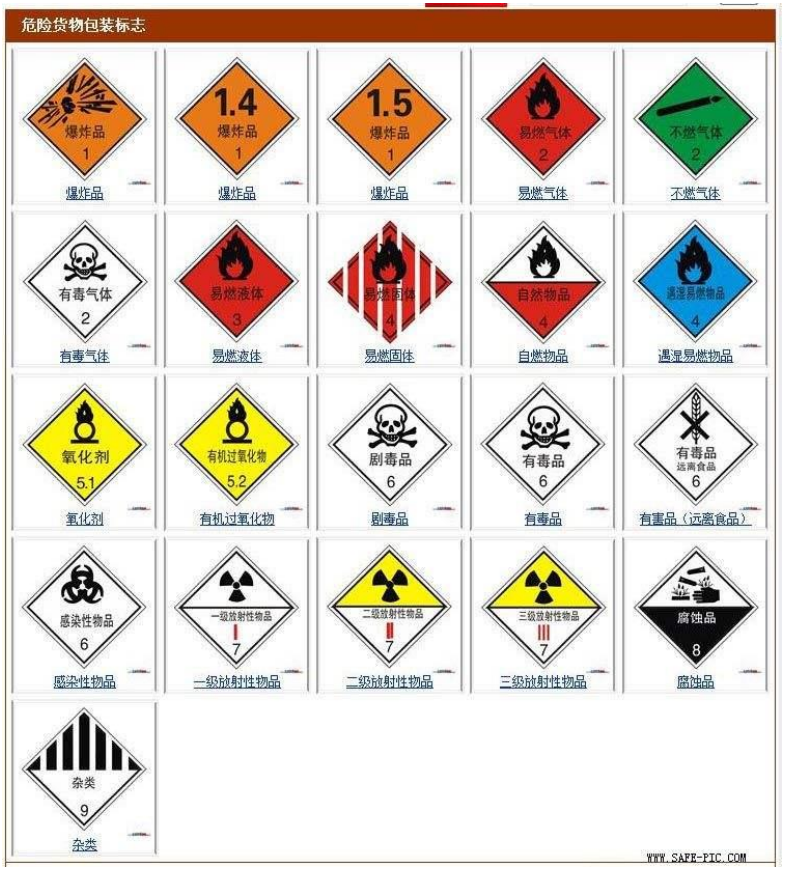


Talking about safety management from the chemicals life cycle

EHS

Introduction, evaluation and registration of chemicals:

- Need to determine the applicant, use and place of use of the chemical;
- Relevant factors such as the type of chemical, storage conditions, operational and environmental requirements, PPE, emergency treatment, etc.
- Registered in the unit management system for the above information .



Talking about safety management from the chemicals life cycle

EHS

Storage and internal transportation:

- Special requirements for the storage and transport of regulatory chemicals
- General chemicals' storage and transportation requirements

Storage area:

- Central warehouse (maximum storage quantity)
- Laboratory (total 100L or 100Kg, individually packaged 20L/25Kg)

Talking about safety management from the chemicals life cycle

EHS

Use:

- Laboratory engineering control
- Lab safety guidelines
- PPE

Emergency treatment:

- Equipment preparation
- Response training

Talking about safety management from the chemicals life cycle

EHS

Waste disposal:

1. The classification of experimental waste should be based on relevant national waste classification regulations.
2. Local waste disposal requirements
3. The extent to which the school can pretreat

Key to chemicals safety management:

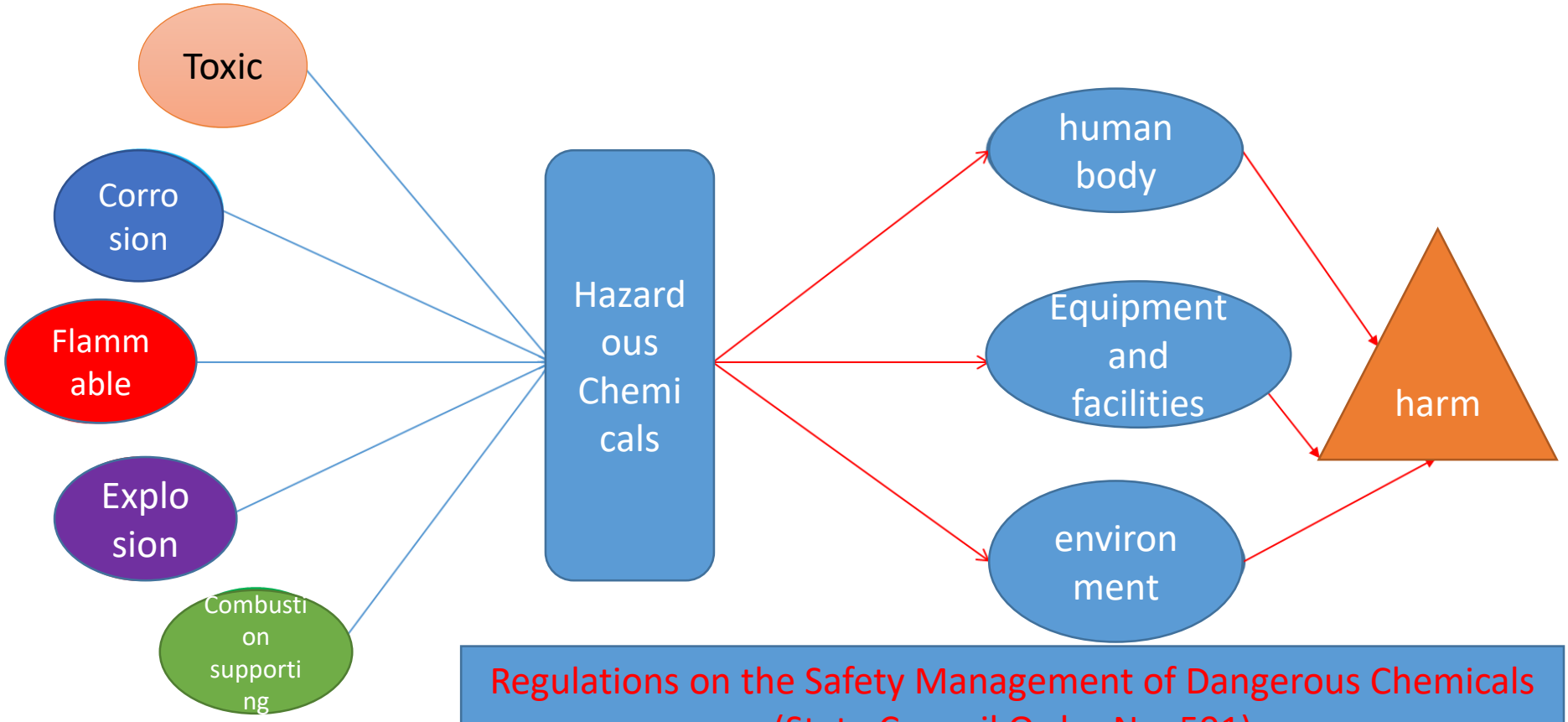
1. Hazardous chemicals (including highly toxic chemicals)

2. Precursor chemicals

3. Explosive chemicals

4. Regulatory chemicals

1.Hazardous chemicals (definition)



Regulations on the Safety Management of Dangerous Chemicals (State Council Order No. 591)

1.Hazardous chemicals (including highly toxic chemicals)

There are 2,828 kinds of dangerous chemicals listed in the *Catalogue of Hazardous Chemicals* (2015 Edition), including 148 highly toxic chemicals.

Highly toxic chemicals - generally chemicals with severe toxic hazards, including synthetic chemicals and their mixtures and natural toxins, as well as chemicals that are acutely toxic and pose a public safety hazard.

The highly toxic chemicals should be stored separately in a dedicated warehouse, and a two-person transfer and double-custodian system should be implemented. The storage unit shall report the storage quantity, storage location and the status of the management personnel to the local safety supervision department and the public safety organ for the record.

2.Precursor chemicals - refer to substances regulated by the state which can be used to manufacture drugs, including precursor chemicals, raw materials and chemical additives.

Identification basis: *Catalogue of Classification and Varieties of Precursor Chemicals* and Supplementary Catalogue Announced by the State Council.

Regulatory requirements: *Regulations on the Administration of Precursor Chemicals* (Order No. 445 of the State Council, revised in 2018).

Precursor chemicals among the most common hazardous chemicals: toluene, acetone, methyl ethyl ketone, potassium permanganate, sulfuric acid, hydrochloric acid, and bromine.

Chemicals Safety Management

There are 32 substances in 3 categories of precursor chemicals

Category I
1.1-phenyl-2-propanone
2.3,4-methylenedioxyphenyl-2-propanone
3. Piperonal
4. Jaundice
5. Astragalus oil
6. Isoflavone
7. N-acetylanthranilic acid
8. Anthranilic acid
9. Lycopene
10. Ergotamine
11. Ergometrine
12. Ephedrine, pseudoephedrine, racemic ephedrine and other ephedrine substances
13. Hydroxyimine
14.1-phenyl-2-bromo-1-propanone
15.3-oxo-2-phenylbutyronitrile
16. O-chlorophenylcyclopentanone
17. N-phenethyl-4-piperidone
18. 4-anilino-N-phenethylpiperidine
19. N-methyl-1-phenyl-1-chloro-2-propylamine

Category II
1. Phenylacetic acid
2. Acetic anhydride
3. Chloromethane
4. Ether
5. Piperidine
6. Bromine[3]
7.1-phenyl-1-acetone

Category III
1. Toluene
2. acetone
3. Methyl ethyl ketone
4. potassium permanganate
5. sulfuric acid
6. hydrochloric acid

3.Chemicals can be used to produce explosives - can be used as raw materials or accessories to make explosive properties.

Identification basis: ***List of Explosive Dangerous Chemicals*** **(2017 Edition)**

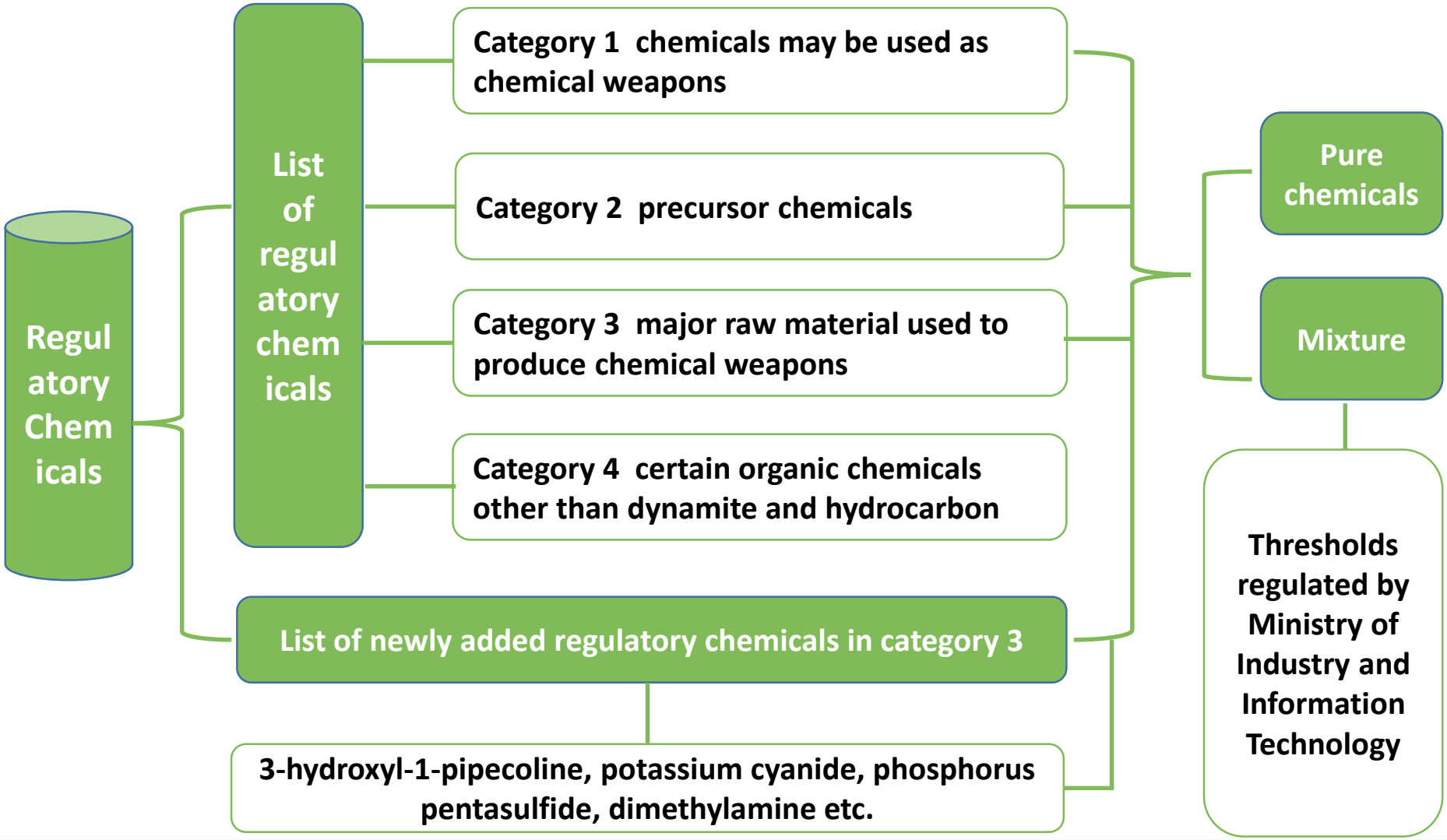
Regulatory requirements: ***Administrative Measures for the Safety of Explosive Hazardous Chemicals*** **(Order No. 154 of the Ministry of Public safety)**

The units that are vulnerable to explosives and dangerous chemicals shall establish an information system for explosive chemicals that is easy to blast, and realize the interconnection and intercommunication with the information system of the public safety organs. Units that are vulnerable to blast dangerous chemicals shall implement electronic tracking and labeling management for the explosive chemicals that are easy to blast, and monitor and record the flow of dangerous chemicals that are easy to blast.

4. Regulatory chemicals - those items that are strictly controlled by the state and local governments and can be used to produce chemical weapons.

Identification basis and regulatory requirements: *Regulations of the People's Republic of China on the Control of Chemicals* (Decree No.190 of the State Council of the People's Republic of China)

Chemicals Safety Management



SDS vs MSDS

SDS is the acronym for Safety Data Sheet. The REACH Regulation (Order No. EC 1907/2006) specifies the content of the SDS in Appendix II, which was revised in May 2010 by Directive 453/2010.

MSDS: MSDS is the acronym for Material Safety Data Sheet. There are many standards for the development of MSDS, mainly standards set by GHS, ANSI, ISO, OSHA, and WHMIS.

SDS and safety labels

The European Union and the International Organization for Standardization (ISO) use the SDS terminology. However, in the United States, Canada, Australia and many countries in Asia, SDS (Safety Data Sheet) can also be used as MSDS (Material Safety Data Sheet), the role of two technical documents. Basically consistent.

In 2008, China revised the standard GBT_16483-2008 *Safety Data Sheet for Chemical Products Contents and Order of Sections* and unified it with the International Organization for Standardization, abbreviated as SDS.

The two acronyms SDS and MSDS play a completely identical role in the supply chain, with only minor differences in content.

SDS and safety labels

SDS（Safety Data Sheet) contains 16 sections:	
1. Chemical product and company information	9. Physical and chemical properties
2. Hazards identification	10. Stability and reactivity
3. Composition/information on ingredients	11. Toxicological information
4. First-aid measures	12. Ecological information
5. Fire-fighting measures	13. Disposal considerations
6. Accidental release measures	14. Transport information
7. Handling and storage	15. Regulatory information
8. Exposure controls/personal protection	16. Other information

- SDS content
- SECTION 1 Chemical Product & Company Information
- include:
  - Chemical name
  - Information such as the manufacturer's name, address, zip code, telephone number, emergency number, fax number, and email address.

SDS and safety labels

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name	:	Acetone
Product Number	:	650501
Brand	:	Sigma-Aldrich
Index-No.	:	606-001-00-8
REACH No.	:	01-2119471330-49-XXXX
CAS-No.	:	67-64-1

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses	:	Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company	:	Sigma-Aldrich Company Ltd. The Old Brickyard NEW ROAD, GILLINGHAM Dorset SP8 4XT UNITED KINGDOM
Telephone	:	+44 (0)1747 833000
Fax	:	+44 (0)1747 833313
E-mail address	:	eurtechserv@sial.com

1.4 Emergency telephone number

Emergency Phone #		+44 (0)870 8200418 (CHEMTREC)

Call for help in the event of a chemical accident

SDS and safety labels

- SECTION 2 Hazards Identification A brief overview of the most important hazards and effects of this chemical.
- Mainly include:
  - Hazard category,
  - Route of invasion,
  - Health hazard,
  - Environmental hazards,
  - Information on the danger of explosion.

SDS and safety labels

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008
Flammable liquids (Category 2), H225
Eye irritation (Category 2), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008
Pictogram

Signal word	Danger
Hazard statement(s)	
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.

The hazard of chemicals can be preliminarily judged by pictograms, which are generally found on SDS, safety labels and chemical packaging.

SDS and safety labels

Precautionary statement(s)

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233	Keep container tightly closed.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

Supplemental Hazard information (EU)

EUH066	Repeated exposure may cause skin dryness or cracking.

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SDS and safety labels

- SECTION 3 Composition/Information on Ingredients Indicate whether the chemical is a pure chemical or a mixture.
  - For pure chemicals, the chemical name or trade name and common name should be given.
  - For mixture, the concentration or concentration range of the hazardous component should be given .
  - No matter it is a pure chemical or a mixture, if it contains harmful components, a Chemical Abstracts Index registration number (CAS number) should be given.

SDS and safety labels

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_3H_6O
Molecular weight	:	58.08 g/mol
CAS-No.	:	67-64-1
EC-No.	:	200-662-2
Index-No.	:	606-001-00-8
Registration number	:	01-2119471330-49-XXXX

Hazardous ingredients according to Regulation (EC) No 1272/2008

Component		Classification	Concentration
Acetone			
CAS-No.	67-64-1	Flam. Liq. 2; Eye Irrit. 2; STOT SE 3; H225, H319, H336 Concentration limits: >= 20 %: STOT SE 3, H336;	<= 100 %
EC-No.	200-662-2		
Index-No.	606-001-00-8		
Registration number	01-2119471330-49-XXXX		

For the full text of the H-Statements mentioned in this Section, see Section 16.

SDS and safety labels

- SECTION 4 First Aid Measures Refers to the treatment of on-site self-rescue or mutual rescue when the operator is accidentally injured, include:
  - eye contact,
  - skin contact,
  - Inhalation,
  - First aid measures for ingestion.
  - Three ways of contacting people exposed to such chemicals, by controlling contact to avoid injury.

SDS and safety labels

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SDS and safety labels

- SECTION 5 Fire Fighting Measures It mainly indicates the physical and chemical specific hazards of chemicals, and is suitable for fire extinguishing media, unsuitable fire extinguishing media, and personal protection of firefighters.
- include:
  - Hazardous characteristics,
  - Extinguishing media and methods,
  - Fire fighting precautions, etc.
  - Such as: metal sodium, potassium metal and xylene, trimethylbenzene fire extinguishing media is not the same

SDS and safety labels

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Dry powder Dry sand

Unsuitable extinguishing media
Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

Fire-fighting materials that are required for fire, do not use spray water. Mist water can be used to cool down.

Respiratory equipment required to enter the fire.

SDS and safety labels

- SECTION 6 Accidental Release Measures Refers to simple and effective emergency measures, precautions and elimination methods that can be used on site after chemical leakage.
- include:
  - Emergency action,
  - Emergency personnel protection,
  - Environmental protection measures,
  - Eliminate methods and other contents.

SDS and safety labels

Emergency measures can be used as the content of the on-site disposal plan

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

Adsorbent materials can be included in the emergency supplies list

SDS and safety labels

- SECTION 7 Handling and Storage Mainly refers to the information on the handling and safe storage of chemicals.
- include:
  - Safety precautions in handling;
  - Safe storage conditions.

SDS and safety labels

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

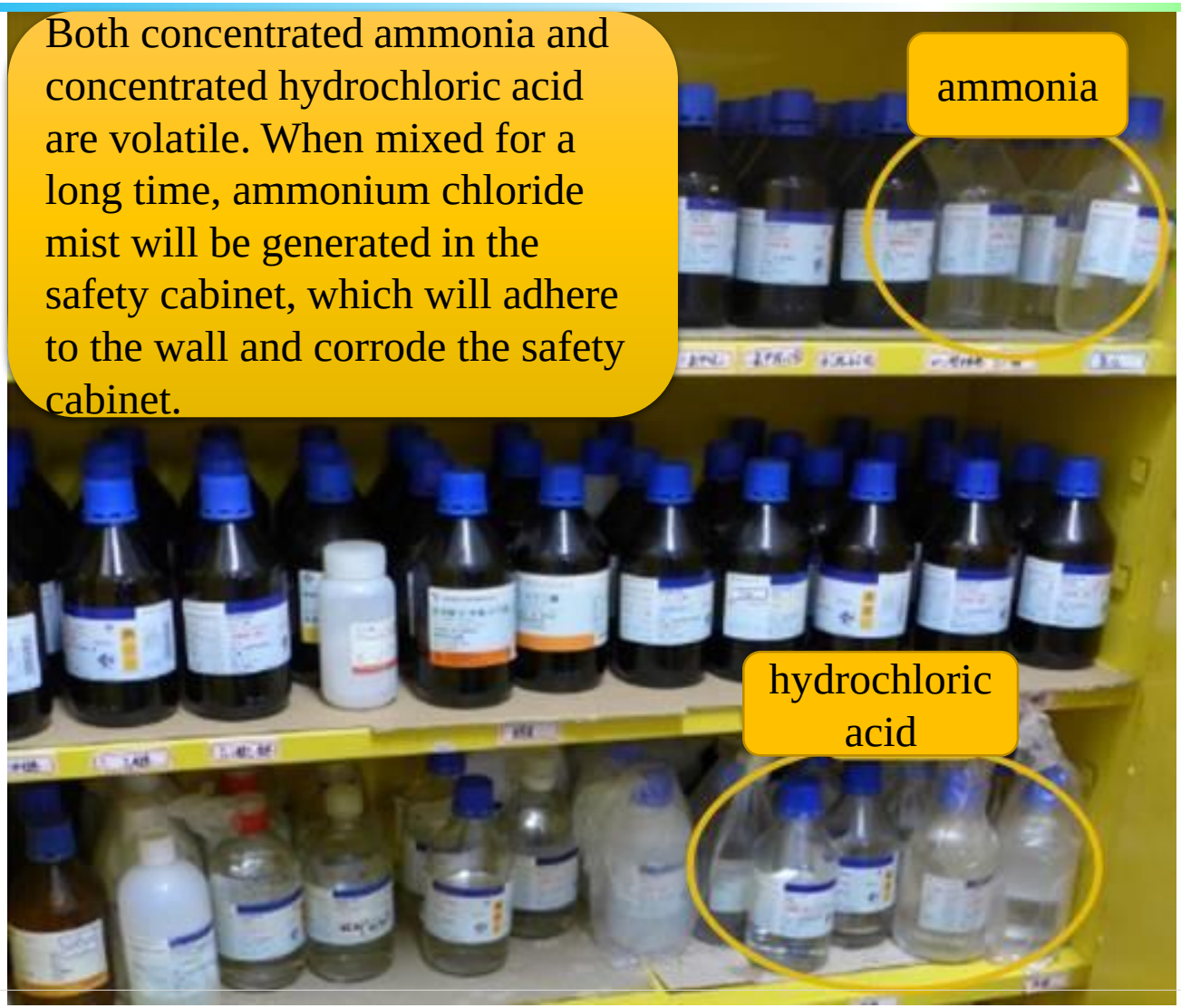
Operational requirements

Storage conditions

Chemicals Safety Management - common problem

?

Both concentrated ammonia and concentrated hydrochloric acid are volatile. When mixed for a long time, ammonium chloride mist will be generated in the safety cabinet, which will adhere to the wall and corrode the safety cabinet.



Chemicals Safety Management - common problem

Problem: Volatile substances in the operating environment may be flammable gases, vapors or toxic and hazardous volatiles.

Recommendation: Volatile reagents should be placed in a cabinet with good ventilation and grounding. The seal of the reagent bottle should be checked after the experiment. Respiratory protective equipment should be used if necessary during the experiment.

Chemicals Safety Management - common problem

- Problem: no appropriate cabinets are used to store chemicals;
- Shelf deformation
- Chemicals are mixed.

- Recommendation: Use chemical-specific cabinets for storage;
- Reasonable storage according to the physical and chemical properties of the chemicals.

SDS and safety labels

8.2	**Storage of Chemical Reagent in Laboratory**	
8.2.1	Check if dynamic account is established for the use of chemicals in laboratories	Establish directory, MSDS or safety card for hazardous chemicals of the laboratories for easy reference; clean the overdue drugs regularly to avoid accumulation
8.2.2	Check if reagent drugs are stored in specific space scientifically and orderly	The storeroom, storage area and storage cabinet should be ventilated, thermal-insulated, sun-proof and safe; the storage area of organic solvents should stay away from the source of heat and ignition; the reagents subject to easy leakage and volatilization should be fully ventilated; no outlet or wiring board should exist in the reagent cabinet; the chemicals should be orderly placed by category; protection functions against secondary leakage, absorption or overflow should be provided; do not stack the reagents, have mixed storage of contraindicated chemicals, place solids and liquids in disorder or keep reagent bottle opened; do not store chemical reagents in experiment bench unless it has a baffle.
8.2.3	Check if total quantity of hazardous chemicals in laboratories conform to the requirements of specification	In principle, the total quantity of hazardous chemicals should not exceed 100L or 100kg, among which, the total quantity of inflammable & explosive chemicals should not exceed 50L or 50kg, and capacity of single packaged container should not exceed 20L or 20kg; leakage alarm and ventilation linkage device must be installed if single experiment device has Class A material tanks over 10L, or Class B material tanks over 20L or Class C material tanks over 50L. The storage quantity of hazardous chemicals can be checked by laboratory area on basis of the standard laboratory area of 50 m^2.
8.2.4	Check if chemical labels are obvious, complete and clear	Up-to-standard labels should be pasted on packages of chemicals and be repasted if such chemicals are transferred or divided into other packages. The chemical labels should be timely supplemented if falling or becoming fuzzy and corroded; otherwise, it should be handled as wasted chemicals.

SDS and safety labels

8.4	**Management of Controlled Chemicals**	
8.4.1	Check if precursor chemicals and potential explosives are stored by category, kept by a specially-assigned person and provided with receiving, use and handling records	Regulatory chemicals should be managed based on "five doubles" systems (double-person acceptance, double-person keeping, double-person receiving, double locks and double accounts); specific safe box should be used for storing the highly toxic products, firmly fixed and managed based on double persons and double locks; the highly toxic products with high volatility and low flash point should be stored in explosion-proof refrigerator and provided with two locks; monitoring and alarm device should be used; the highly toxic products should be used by at least two operators, and be handled in strict accordance with the SOP.
8.4.2	Check if explosives are isolated, stored at limited amount, used and destroyed as specified by public safety department	Check the site and record book; annual list should be provided by functional departments
8.4.3	Check if narcotic drugs and psychotropic drugs are stored in specific safe box and provided with standard accounts for receiving, use and handling	Check the site and record book; annual list should be provided by functional departments

SDS and safety labels

Normal fridge for high volatility and low flash point chemicals

Five double:

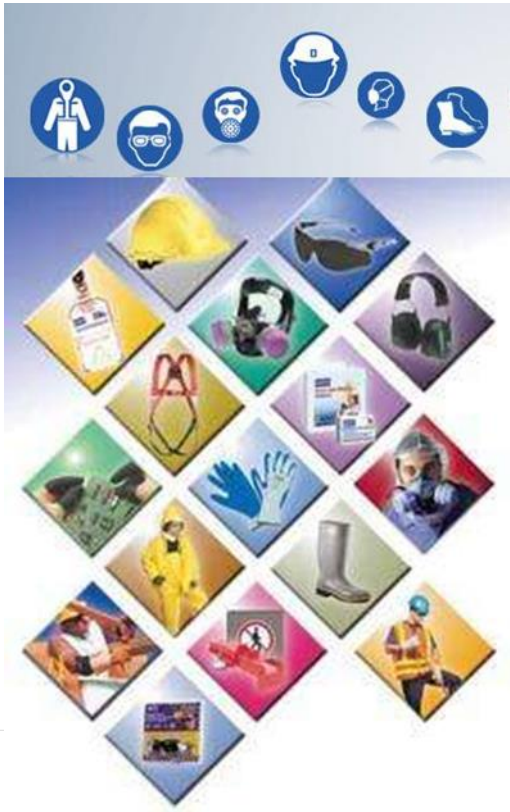
1. double-person acceptance
2. double-person keeping
3. double-person receiving
4. double locks
5. double accounts

SDS and safety labels

We already have the good condition, but how to manage

SDS and safety labels

- SECTION 8 Exposure Controls/Personal Protection Protective methods and means to protect workers from chemical hazards during production, handling and use of chemicals.
- include:
  - Maximum allowable concentration STEL, TWA
  - Engineering control – fume hood,
  - Respiratory protection, eye protection, body protection, hand protection;
  - Other protection requirements.



SDS and safety labels

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	ValueForm of exposure	Control parameters	Basis
Acetone	67-64-1	TWA	500 ppm 1,210 mg/m3	Europe. Commission Directive 2000/39/EC establishing a first list of indicative occupational exposure limit values
	Remarks	Indicative		
		TWA	500 ppm 1,210 mg/m3	UK. EH40 WEL - Workplace Exposure Limits
		STEL	1,500 ppm 3,620 mg/m3	UK. EH40 WEL - Workplace Exposure Limits

Predicted No Effect Concentration (PNEC)

Compartment	Value
Soil	33.3 mg/kg
Marine water	1.06 mg/l
Fresh water	10.6 mg/l
Marine sediment	3.04 mg/kg
Fresh water sediment	30.4 mg/kg
Onsite sewage treatment plant	100 mg/l

SDS and safety labels

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Full contact
Material: butyl-rubber

Use PPE that should be prepared during operation

Body Protection
Impervious clothing, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

SDS and safety labels

- SECTION 9 Physical and Chemical Properties It mainly describes the appearance and physical and chemical properties of chemicals.
- include:
  - Appearance and properties, PH, boiling point, melting point, relative density (water = 1), relative vapor density (air = 1), saturated vapor pressure, heat of combustion, critical temperature, critical pressure, octanol / water partition coefficient,
  - Flash point, ignition temperature, explosion limit, solubility,
  - Main uses and other special physical and chemical properties.
  - Understand the physicochemical hazard characteristics of materials and control them when handling.

SDS and safety labels

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

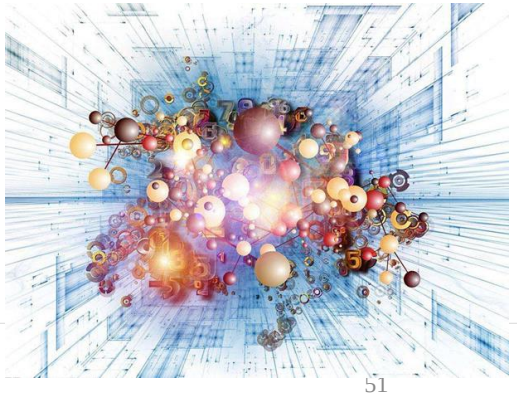
a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -94 °C
f)	Initial boiling point and boiling range	56 °C at 1,013 hPa
g)	Flash point	-17.0 °C - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 13 %(V) Lower explosion limit: 2 %(V)
k)	Vapour pressure	533.3 hPa at 39.5 °C 245.3 hPa at 20.0 °C
l)	Vapour density	No data available
m)	Relative density	0.791 g/mL at 25 °C
n)	Water solubility	completely miscible
o)	Partition coefficient: n-octanol/water	log Pow: -0.24

Low flash point, flammable liquid

Easy to form an explosive mixture after leakage

SDS and safety labels

- SECTION 10 Stability and Reactivity Mainly describes the stability and reactivity of the chemical.
- include:
  - Stability (whether it is decomposed into other harmful components when it is heated)
  - Incompatible materials (reacting with other incompatible materials)
  - Conditions to avoid (such as direct sunlight leading to high temperatures, etc.)
  - Polymerization hazard,
  - Decomposition products.



SDS and safety labels

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Bases, Oxidizing agents, Reducing agents, Acetone reacts violently with phosphorous oxychloride.

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

Prevent all types of ignition sources during storage and operation

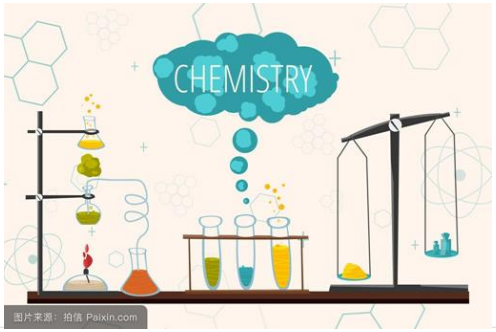
Incompatibility: Do not coexist with the above substances during storage, and avoid direct contact with them during operation.

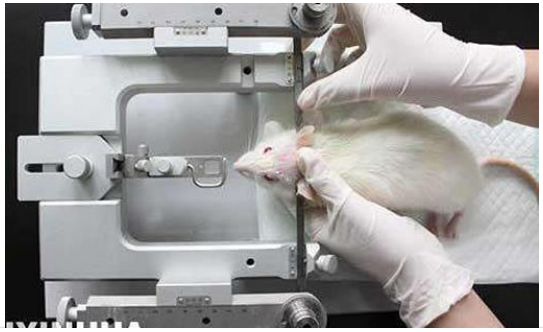
SDS and safety labels

化学危险品的种类和名称			配存顺号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
化学危险品的种类和名称	爆炸品	点火器材	1	1																								
		起爆器材	2	×	2																							
		炸药和爆炸性物品（不同品名的不得在同一库内储存）	3	×	×	3																						
		其他爆炸品	4	△	×	×	4																					
	氧化剂	有机氧化剂	5	×	×	×	×	5																				
		亚硝酸盐、亚氯酸盐、次亚氯酸盐[2]	6	△	△	△	△	×	6																			
		其他无机氧化物[2]	7	△	△	△	△	×	×	7																		
	压缩气体和液化气体	剧毒（液氯与液氯不能在一库内配存）	8		×	×	×	×	×	×	8																	
		易燃	9	△	×	×	△	×	△	△		9																
		助燃（氧及氧气钢瓶不得与油脂类在同一库内配存）	10	△	×	×	△					△	10															
		不燃	11		×	×								11														
	自燃物品	一级	12	△	×	×	×	×	△	△	×	×	×		12													
		二级	13		×	×	△				×	△	△			13												
	遇水燃烧物品（不得与含水液体货物在同一库内配存）		14		×	×	×	△	△	△	△	△	△		×		14											
	易燃液体		15	△	×	×	×	×	△	×	×		×		×	△		15										
	易燃固体（H发孔剂不可与酸性腐蚀物品及有毒或易燃酯类危险货物配存）		16		×	×	△	×	△	△	×		×		×				16									
	毒害品	氰化物	17		△	△														17								
		其他毒害品	18		△	△															18							
	腐蚀物品	酸性腐蚀品 溴	19	△	×	×	×	×				△			×	△	△	△		×	△	19						
		酸性腐蚀品 过氧化物	20	△	×	×	△	△							△	△	×	△		×	△		20					
		酸性腐蚀品 硝酸、发烟硝酸、硫酸、发烟硫酸、氯磺酸	21	△	×	×	×	×	×	1）	×	×	△	△	×	×	△	△	△	×	△	△	△	21				
		酸性腐蚀品 其他酸性腐蚀物品	22	△	×	×	△	△	△	△	△	△			△		△			×	△		△	△	22			
		碱性及其他腐蚀物品 生石灰、漂白粉	23		△	△	△		△	△								△					△	×	△	23		
		碱性及其他腐蚀物品 其他（无水肼、水合肼、氨水不得与氧化剂配存）	24														△							×			24	
易燃物品			25		×	×	△	△			×	×										△	△	×		△		25
饮食品、粮食、饲料、药品、药材类、食用油脂[3]、[4]			26		×	×					×	△			×		×	△	△	×	×	×	△	×	×	×	△	26
非食用油脂			27		×	×																×	△	×		△		27
活动油[3]			28		×	×	△	△	△	△	×	×			×		×	△	△	×	×	×	×	×	×	×	×	28
其他[3]、[4]			29																									29
配存顺号				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	

SDS and safety labels

- SECTION 11 Toxicological Information Provides toxicological information on chemicals.
- include:
  - Acute toxicity of different contact methods (LD50)
  - Irritant, allergenic, subacute and chronic toxicity, mutagenicity, teratogenicity, carcinogenicity, etc.





SDS and safety labels

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 5,800 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex). Behavioral:Tremor. Behavioral:Headache. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

LC50 Inhalation - Rat - 8 h - 50,100 mg/m3
Remarks: Drowsiness Dizziness Unconsciousness

LD50 Dermal - Guinea pig - 7,426 mg/kg

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation - 24 h

Respiratory or skin sensitisation
- Guinea pig
Result: Does not cause skin sensitisation.

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

SDS and safety labels

- SECTION 12 Ecological Information It mainly states the environmental and ecological effects, behaviors and outcomes of chemicals.
- include:
  - Biological effects (eg LD50),
  - Biodegradability,
  - Bioaccumulation,
  - Environmental migration and other harmful environmental impacts.
  - Understand the seriousness of the short-term and long-term damage to the surrounding environment (water, atmosphere, soil)

SDS and safety labels

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 5,540 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 8,800 mg/l - 48 h
Toxicity to algae	Remarks: No data available

12.2 Persistence and degradability

Biodegradability: Result: 91 % - Readily biodegradable. (OECD Test Guideline 301B)

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

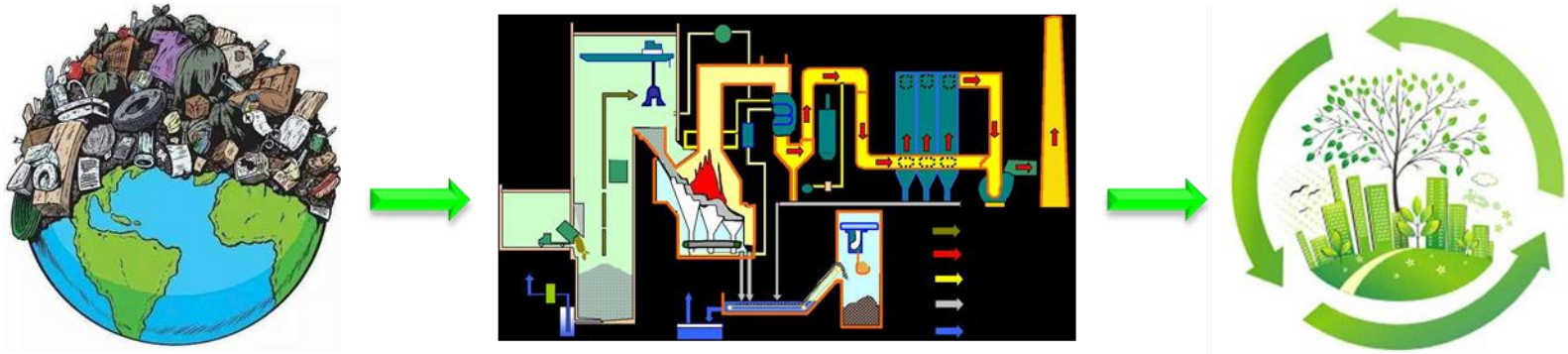
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects

No data available

SDS and safety labels

- SECTION 13 Disposal Considerations Refers to the safe handling of packaging contaminated with chemicals and non-useable chemicals.
- include: Disposal methods and precautions.



SDS and safety labels

?

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Waste material must be disposed of in accordance with the Directive on waste 2008/98/EC as well as other national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

Contaminated packaging

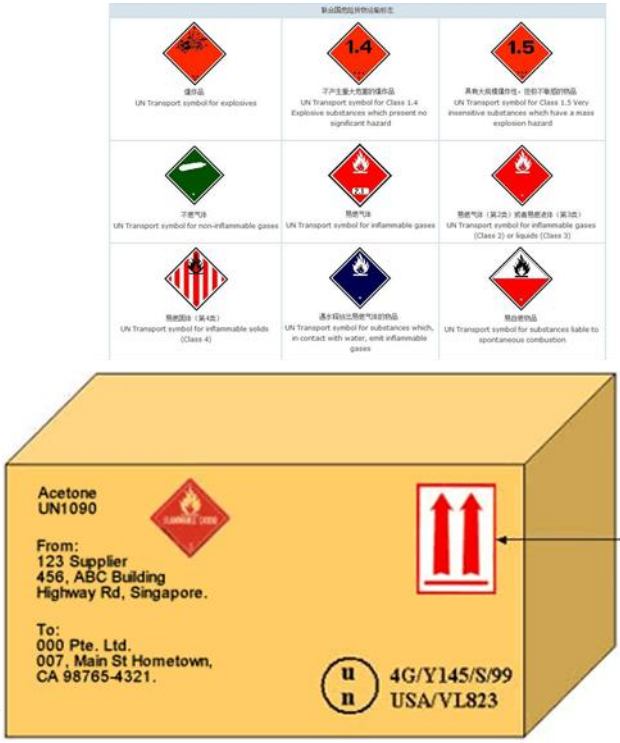
Dispose of as unused product.

Tray or pallet for drums, label missing

Inner cap missing

SDS and safety labels

- SECTION 14 Transport Information Mainly refers to the classification and numbering of domestic and international chemical packaging and transportation requirements and transportation regulations.
- include:
  - Dangerous goods number,
  - Packing category,
  - Packaging mark,
  - Method of packing,
  - UN number and transportation precautions.



SDS and safety labels

SECTION 14: Transport information

14.1 UN number

ADR/RID: 1090 IMDG: 1090 IATA: 1090

14.2 UN proper shipping name

ADR/RID: ACETONE
IMDG: ACETONE
IATA: Acetone

14.3 Transport hazard class(es)

ADR/RID: 3 IMDG: 3 IATA: 3

14.4 Packaging group

ADR/RID: II IMDG: II IATA: II

14.5 Environmental hazards

ADR/RID: no IMDG Marine pollutant: no IATA: no

14.6 Special precautions for user

No data available

SDS and safety labels

- SECTION 15 Regulatory Information Mainly refers to the legal provisions and standards for chemicals management.
- Such as：
  - *Globally Harmonized System of Classification and Labeling of Chemicals*， Abbreviation GHS
  - REACH Regulation（1907/2006）
  - CLP Regulation（EC NO. 1272/2008）
  - 67/548/EEC appendix III
  - Instruction 2001/58/EC
  - Material Classification and Label Management Directive 67/548/EEC (ie DSD Directive)
  - Classification labeling instructions for mixtures 1999/45/EEC (ie DPD directives)
  - General Rules for the Classification and Hazard of Chemicals (GB-13690-2009)
  - Preparation of Chemical Safety Data Sheet (GB 16483-2008)
  - Chemical Safety Labeling Regulations (GB 15258-2009)

SDS and safety labels

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Acetone	67-64-1	

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Acetone	67-64-1	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Acetone	67-64-1	

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

SDS and safety labels

- SECTION 16 Other Information Mainly provides other information that is important to safety.
- include:
  - References,
  - Time of the form (SDS),
  - Department filling in the form,
  - Data review unit, etc.

SDS and safety labels

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

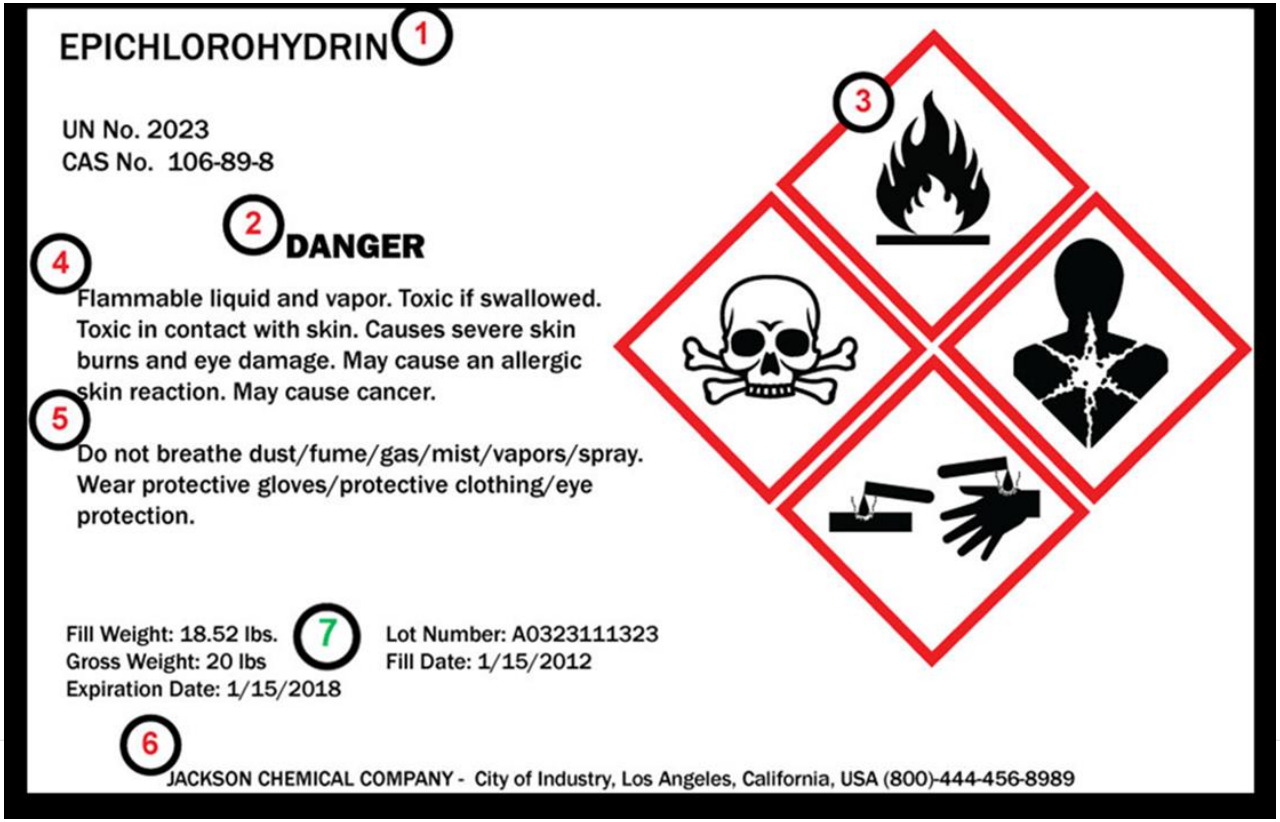
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1 Revision Date: 05/28/2017 Print Date: 10/14/2019

SDS and safety labels

- safety labels
- Safety labels use a combination of words, graphic symbols and codes to indicate the hazards and safety precautions of the chemical.



SDS and

1 化学品名称　A组分：40%；B组分：60%

2 危　险

3

极易燃液体和蒸气，食入致死，对水生生物毒性非常大　4

【预防措施】

- 远离热源、火花、明火、热表面。使用不产生火花的工具作业。
- 保持容器密闭。
- 采取防止静电措施，容器和接收设备接地、连接。
- 使用防爆电器、通风、照明及其他设备。
- 戴防护手套、防护眼镜、防护面罩。
- 操作后彻底清洗身体接触部位。
- 作业场所不得进食、饮水或吸烟。
- 禁止排入环境。

【事故响应】

- 如皮肤（或头发）接触：立即脱掉所有被污染的衣服。用水冲洗皮肤、淋浴。
- 食入：催吐，立即就医。
- 收集泄漏物。
- 火灾时，使用干粉、泡沫、二氧化碳灭火。

【安全储存】

- 在阴凉、通风良好处储存。
- 上锁保管。

5

【废弃处置】

- 本品或其容器采用焚烧法处置。

请参阅化学品安全技术说明书　8

供应商：××××××××××××××××××××　电话：××××××

地　址：××××××××××××××××××××　邮编：××××××　6

化学事故应急咨询电话：××××××　7

SDS and safety labels - GHS pictograms

Flame	Flame over circle	Exploding bomb
		
Corrosion	Gas cylinder	Skull and crossbones
		
Exclamation mark	Environment	Health Hazard
		

SDS and safety labels

Health Hazard
Blue Diamond

4-Deadly
3-Extreme Danger
2-Hazardous
1-Slightly Hazardous
0-Normal Material

Fire Hazard
Red Diamond

Flash Points
4-Below 73°F
3-Below 100°F
2-Above 100°F
not exceeding 200°F
1-Above 200°F
0-Will not burn

Specific Hazard
White Diamond

ACID - Acid
ALK - Alkali
COR - Corrosive
OXY - Oxidizer
- Radioactive
- Use No Water

Reactivity
Yellow Diamond

4-May Detonate
3-Shock & Heat
may detonate
2-Violent Chemical
change
1-Unstable if heated
0-Stable

- Problem: Chemical reagents' labeling is unclear or missing.

SDS and safety labels

- The role of SDS and safety labels
- According to the content of SDS or safety label, the requirements for storage and use of chemicals can be clarified;
- It can be used as the basis for matching PPE;
- Section 5, 6, and 8 of the SDS can be used as emergency measures.

SDS and safety labels

5. Fire Fighting Measures
6. Accidental Release Measures
7. Handling and Storage
9. Physical and Chemical Properties
10. Stability and Reactivity

Take the school chemical warehouse storage as an example:
Storage needs to be based on the environmental sensitivity of each substance (sunlight, ambient temperature), compatibility with other chemicals, fire-fighting characteristics;
How to control the amount of leakage regarding varied packaging;
Extinguishing media when the material is on fire;
Design the maximum storage and storage location for storage based on the nature of existing chemicals.




SDS and safety labels

For on-site operation:

- SDS information facilitates on-site development of “Occupational Hazard Notification Card”

The information includes:

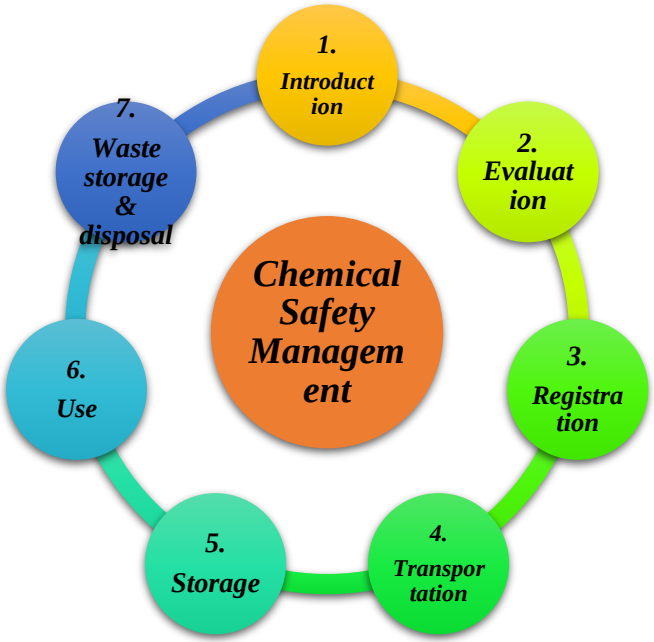
- GHS pictogram;
- Health hazard;
- Physical and chemical properties;
- Emergency treatment measures;
- PPE.

SDS and safety labels

- How to use SDS to assist in emergency response under abnormal conditions?
- How to ensure the safety of evacuated personnel;
- How to ensure the safety of rescuers, prevent injuries during rescuing action and how to clean up chemicals on rescuers after completing the rescue;
- How to ensure chemical leaks, fires, occupational injuries are effectively handled;
- How to ensure the environment (not flowing into the rainwater system, not entering the soil environment, not dissipate into the atmosphere)

Chemicals management system

---Informatization, scientific management



EHS

„Nothing we do is worth getting hurt for !“

没什么是值得以牺牲安全作为代价！