

Safety and Health Training

Management and Use of Chemicals

– For Safe Handling of Chemicals –

Health Care and Safety Center,
Miyazaki University

Outline

Introduction



1. Notification of Chemical Substance Managers
2. Registration in the Chemical Management System (CMSsystem)
3. Precautions for Handling Chemicals
4. Proper Handling of Chemical Substances
5. Types of Chemical Substances and Obligations During Use
6. Periodic Self-inspection of Chemical Substances (Online inspection)

Please also refer to the Chemical Handling Manual.

Introduction



- ✓ This presentation outlines the basic guidelines necessary for the proper handling of chemical substances and ensuring health and safety.
 - ✓ Handling chemicals without sufficient knowledge may lead to:
 - harm to the human body
 - serious accidents such as fires or explosions
 - ✓ To prevent health problems and accidents, plan and conduct experiments safely on a daily basis and avoid overexertion.
-

1. Notification of Chemical Substance Managers, etc.

- ❑ Register a Chemical Substance Manager and related personnel for the safe use and proper management of chemicals
 - ✓ Each laboratory must submit the following notification:
 - Application form for chemical substance manager
 - Designate a manager for each laboratory when using chemicals.
 - Notification form for chemical handling
 - Manager, safety officer, user, and the handling room
 - Changes within 14 days, retirement within 30 days
 - Application form for manager of personal protective equipment (PPE) use (Change)
 - Selection and usage monitoring of PPE
 - ✓ Notify HCSC of new registration as well as changes or cancellations
 - ✓ Retiring faculty members are required to submit a notification of termination and complete the disposal or transfer of chemicals before retirement.
-

2. Registration in the Chemical Management System

(1) CMSystem

□ CMSystem for Safe Use and Proper Management of Chemicals

✓ Each laboratory must register and manage the following items in the system

- Purchase (Obtaining chemicals)

→ Affix a container ID (barcode) to each individual bottle of product and register it

- Use → Scan the container ID barcode and enter the amount used

- Use up → Processing empty containers

- Disposal → Disposal processing

✓ Conduct regular "Stocktaking" to verify the information

✓ Compile data on the quantities of chemicals stored and used by each laboratory

Container ID barcode
(Unique to each bottle)



2. Registration in the Chemical Management System

(1) CMSystem

- ❑ Chemicals and Compressed gases Requiring Registration
- ✓ Register all chemicals and compressed gases
(Verification of legal regulations as well as inventory control)
- ✓ The following substances must be registered without exception:
 - Poisonous and deleterious substances • Hazardous materials
 - Organic solvents • Specified chemical substances
 - PRTR Substances
- ✓ Except for the following (Stricter control)
 - Radioactive material • Narcotics and Psychotropics
 - Genetically Modified Organism • Pathogens etc.
- ✓ Contact HCSC when setting up a laboratory

2. Registration in the Chemical Management System

(2) Chemical Risk Assessment (CRA)

- ❑ Method for evaluating the risks arising from the hazards and health effects of chemicals used in laboratories and for reducing those risks (Made mandatory by revision of the Industrial Safety and Health Act)
- ✓ Use the CRA tool built into the CMSystem
 - ⇒ It provides a simple assessment of the risk level associated with the use of chemicals
- ✓ By confirming possession of the target substance and entering annual amount and time, clothing condition, and ventilation condition, the risk level can be evaluated for each type of experiment or operation.

Hazard level:

the intrinsic, the intrinsic capability of a chemical to cause harm (1~5)

Exposure level:

the degree of contamination in the work environment (1~5)

Risk level evaluation

Risk level ≥ 3
Risk reduction measures

Risk level **5** : Unacceptable risk

Risk level **4** : Major risk

Risk level **3** : Moderate risk

Risk level **2** : Acceptable risk

Risk level **1** : Minor risk

Hazard
risk
High

3. Precautions for Handling Chemicals

Always assume that all chemicals (reagents) handled in laboratories are toxic and harmful to humans, and handle them properly.

(1) Pre-experiment

This information should be readily accessible to everyone.

- ❑ Obtain the [Safety Data Sheet \(SDS\)](#) and other relevant information from chemical suppliers, the Japan Reagent Association website, and the CMSystem.

Understand the toxicity, hazards, and properties of each chemical so that it can be handled properly.

1. [Toxicity](#) (acute toxicity, chronic toxicity, carcinogenicity, etc., methods of detoxification)
2. [Hazards](#) (flammability, ignitability, explosiveness, etc.)
3. [Physical and chemical properties](#)
(boiling point, density, acidity/alkalinity, and handling precautions, etc.)

Take special care with reagents used for the first time and procedures performed for the first time.

3. Precautions for Handling Chemicals

(2) Safe experiments

Revise Experimental conditions, Protective equipment, and Ventilation methods to reduce the risk level.

1. Wear appropriate **personal protective equipment (PPE)** such as disposable protective gloves, safety goggles, and, when necessary, a gas mask or respirator.
 2. Work in a **fume hood** and ensure sufficient laboratory ventilation.
- ✓ When possible, **do not work alone** when handling chemicals during experiments or research. In the event of an accident, a person working alone may panic and be unable to respond appropriately.
 - ✓ Many accidents also occur during post-experiment disposal and cleanup.



Carry out risk assessment throughout the entire process, from preparation to cleanup.

3. Precautions for Handling Chemicals

(3) Disposal after experiments

Do not pour experimental waste liquids directly into the sink.

- ✓ Collect waste liquids **separately by type** in polyethylene **waste-liquid containers**.
- ✓ Take particular care when disposing of the following:
 - **heavy metals** such as **mercury** and **cadmium**
 - **organochlorides** such as **dichloromethane** and **chloroform**
- ✓ For details, see the [Guide to Waste Disposal](#) on the Miyazaki University website.



(4) Notes on waste-liquid tanks

1. Use vinyl tape, etc. to **color-code** tanks by type.
2. Fill containers only to about **80%** of their capacity.
3. Watch for **damage** and **deterioration** of waste-liquid tanks.
4. Use caps with a **packing** or an **inner lid**.

to
prevent
leakage

4. Proper Handling of Chemical Substances

Recognize that chemicals have **hazardous** and **harmful** properties. Understand which **laws regulate** them and what **hazards** they present.

- **Toxic** to the human body
→ “Poisonous and Deleterious Substances Control Law”
- **Dangerous** in terms of **explosion** or **ignition**
→ “Fire Service Act”

Recognize that **chemicals have various aspects**.

- **Handling** to prevent health damage and **monitoring** of exposure conditions
 - Chemicals affect not only human health but also the **environment** (**environmental pollutants**)
-

4. Proper Handling of Chemical Substances

Chemical substances must be managed appropriately.

- a) Store chemicals in a **dedicated storage cabinet**.
 - b) **Secure** the cabinet against tipping in case of disasters.
 - c) **Prevent falling and breakage** inside the cabinet by using frames, etc.
 - d) For poisonous and deleterious substances, keep the **cabinet locked** to prevent theft and **manage keys**.
 - e) Clearly assign responsibilities and handling procedures.
(Chemical Substance Manager / Person in Charge of Chemical Usage/ Person Responsible for PPE Use)
 - f) **Promptly dispose** of chemicals that have been stored for a long time and are unlikely to be used in the future.
-

5. Types of Chemical Substances and Obligations During Use

(1) Specified Chemical Substances and Organic Solvents

These are specified under the Industrial Safety and Health Act as substances that may cause health disorders upon exposure.

Required measures include:

1. Installation of **local exhaust ventilation (LEV)**.
2. **Periodic voluntary inspection** of LEV (once a year)
3. **Work environment measurements** (once every six months)
4. Preservation of **measurement records**
(3 years, 7 years (for dust) or 30 years)
5. Preservation of **work records** for **pecially controlled substances** (Ordinance on the Prevention of Hazards due to Specified Chemical Substances, **OPHS**)
6. **Special medical examination** (once every six months)



5. Types of Chemical Substances and Obligations During Use

(1) Specified Chemical Substances and Organic Solvents

These are specified under the Industrial Safety and Health Act as substances that may cause health disorders upon exposure.

7. Required Notices in the Workplace

- a) Prohibit entry
to the workplace and
post a clearly visible notice.
(OPHS)

關係者以外立入禁止

- b) Prohibit smoking, eating,
and drinking
in the workplace and
post a clearly visible notice.
(OPHS)

飲食・喫煙禁止

- c) Display the classification of
organic solvents:

- Class 1 : red
- Class 2 : yellow
- Class 3 : blue

第一種有機溶剤

第二種有機溶剤

第三種有機溶剤

5. Types of Chemical Substances and Obligations During Use

(1) Specified Chemical Substances and Organic Solvents

These are specified under the Industrial Safety and Health Act as substances that may cause health disorders upon exposure.

7. Notice in Workplace

d) Display the name of the Chemical Substance Manager and other responsible personnel.

研究室等名	〇〇	〇〇
化学物質管理者	〇〇	〇〇
化学物質 使用責任者	〇〇	〇〇
保護具着用者 管理責任者	〇〇	〇〇
毒物・劇物	☐ あり	☐ なし
特定化学物質	☐ あり	☐ なし
有機溶剤	☐ あり	☐ なし

e) Display the duties of the Operations Supervisor.

有機溶剤 作業主任者の職務

1. 作業に従事する労働者が有機溶剤により汚染され、又はこれらを吸入しないように、作業の方法を決定し、労働者を指揮すること。
2. 局所排気装置、プッシュプル型換気装置又は全体換気装置を1月を超えない期間ごとに点検すること。
3. 保護具の使用状況を監視すること。
4. タンクの内部において有機溶剤業務に労働者が従事するときは、第26条各号に定める措置が講じられていることを確認すること。

(タンク内作業)

第26条 事業者は、タンクの内部において有機溶剤業務に労働者を従事させるときは、次の措置を講じなければならない。

- 1 作業開始前、タンクのマンホールその他有機溶剤等が流入するおそれのない開口部をすべて開放すること。
- 2 労働者の身体が有機溶剤等により著しく汚染されたとき、及び作業が終了したときは、直ちに労働者に身体を洗浄させ、汚染を除去させること。
- 3 事故が発生したときにタンクの内部の労働者を直ちに退避させることができる設備又は器具等を整備しておくこと。
- 4 前各号に掲げる措置のほか、有機溶剤等を入れたことのあるタンクについては、作業開始前に、次の措置を講ずること。
イ 有機溶剤等をタンクから排出し、かつ、タンクに接続するすべての配管から有機溶剤等がタンクの内部へ流入しないようにすること。
ロ 水又は水蒸気等を用いてタンクの内壁を洗浄し、かつ、洗浄に用いた水又は水蒸気等をタンクから排出すること。
ハ タンクの容積の三倍以上の量の空気を逆気し、若しくは排気するか、又はタンクに水を満たした後、その水をタンクから排出すること。

作業主任者
氏 名

(1) Specified Chemical Substances and Organic Solvents

7. Notice in Workplace

✓ Include the following:

- the need for effective respiratory PPE and the type of PPE required

[illegible]

5. Types of Chemical Substances and Obligations During Use

(1) Specified Chemical Substances and Organic Solvents

These are specified under the Industrial Safety and Health Act as substances that may cause health disorders upon exposure.

7. Notice in Workplace

g) Labeling

Label any substance transferred to another container.

The label must include:

- name
- hazards and harmful effects

Attach the label to the new container

キシレン	
Xylene	
	劇
	有2

5. Types of Chemical Substances and Obligations During Use

(2) Poisonous and Deleterious Substances

Even a small amount may endanger life.

Loss or theft may lead to a serious incident.

If loss, leakage, or scattering may harm third parties, notify the public health center, police, or fire department immediately and take measures to prevent danger.

The following requirements must be observed.



5. Types of Chemical Substances and Obligations During Use

(2) Poisonous and Deleterious Substances

1. Proper management of poisonous and deleterious substances

- Store them in a **dedicated storage cabinet**, such as a **metal cabinet**, separate from ordinary chemicals. (Cabinets with glass or plastic doors are not acceptable from the perspective of theft prevention.)
- Keep the cabinet **locked** to prevent theft, and ensure that the **key is managed** by the responsible person.
- Clearly label the cabinet and containers so that they can be identified from outside. (Labels are distributed by each department)

Poisonous substances:

White letters on a red background

医薬用外毒物

Non-medical poison

Deleterious substances:

Red letters on a white background

医薬用外劇物

Non-medical
deleterious substance



5. Types of Chemical Substances and Obligations During Use

(2) Poisonous and Deleterious Substances

1. Proper management of poisonous and deleterious substances
 - d) Track inventory and usage.
Check stock regularly.
※ Conduct regular **Stocktaking** in the CMSystem to verify the information (at least **once a year**)
 - e) **Secure storage cabinets to the floor**, etc.
Prevent containers from **falling from shelves** and contact breakage of glass bottles.
 - f) Clarify **handling procedures** and **management responsibilities**.
 - g) **Promptly dispose** of bottles that have been stored for a long time and are unlikely to be used in the future.



5. Types of Chemical Substances and Obligations During Use

(2) Poisonous and Deleterious Substances

[Good Examples]



- Sturdy dedicated storage cabinet
- Kept locked at all times
- Key securely managed
- Legal labels displayed
- Hazardous substances clearly separated



5. Types of Chemical Substances and Obligations During Use

(2) Poisonous and Deleterious Substances

[Bad Example]



- ✗ Mixed with unrelated materials
- ✗ Poor housekeeping
- ✗ Glass-door cabinet
- ✗ Stored together with beverages
- ✗ Key left in the lock
- ✗ No measures to prevent breakage



5. Types of Chemical Substances and Obligations During Use

(3) Hazardous Materials

- Under the Fire Service Act, hazardous materials are classified into the following six categories:

Hazardous Materials

- Easy ignited
- Prone to fire spread
- Difficult to extinguish

Category I	Oxidizing solids
Category II	Combustible solids
Category III	Spontaneously combustible substances and Water-reactive substances
Category IV	Flammable liquids
Category V	Self-reactive substances
Category VI	Oxidizing liquids

The **handling** method and **fire-extinguishing** method are completely different depending on the type of hazardous material. Prepare appropriate **fire extinguishers**, **fire sand**, **water**, etc. when handling them.



5. Types of Chemical Substances and Obligations During Use

(4) Compressed Gas

Accidents involving high pressure gases

⇒ Gas discharge or leakage caused by tipping or damage to gas cylinders, accompanied by fire, explosion, or poisoning

Handling is regulated by the **High Pressure Gas Safety Act**.

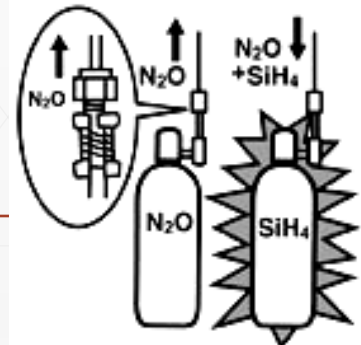
- In 1997, the former High Pressure Gas Control Act was revised to the **High Pressure Gas Safety Act**.
- The revised Act places greater emphasis on autonomous safety management.

Article 1 :

For the purpose of preventing disasters caused by high pressure gases, this Act aims to secure public safety by regulating ...

(Since the monosilane explosion accident at Osaka University in 1991)

The following points must be observed.



5. Types of Chemical Substances and Obligations During Use

(4) Compressed Gas

1. Correct installation of compressed gas cylinders
 - a) Place cylinders in a well-ventilated location where the room temperature is 40°C or lower. Hydrogen should not be placed indoors because it has a wide flammable/explosive range (4–75%).
 - b) Keep cylinders **upright** and secure them at **two points with chains** to prevent tipping. Additional fixation with a fabric belt is also recommended.
 - c) No open flames within 2 m around the cylinder.
 - d) Distinguish and store full cylinders and empty cylinders separately.
 - e) **Oxidizing gases** such as oxygen must not be stored together with **flammable gases**, **combustible materials**, or **toxic gases**.
 - f) Cylinders that are more than **5 years** past manufacture must be **returned promptly**.



5. Types of Chemical Substances and Obligations During Use

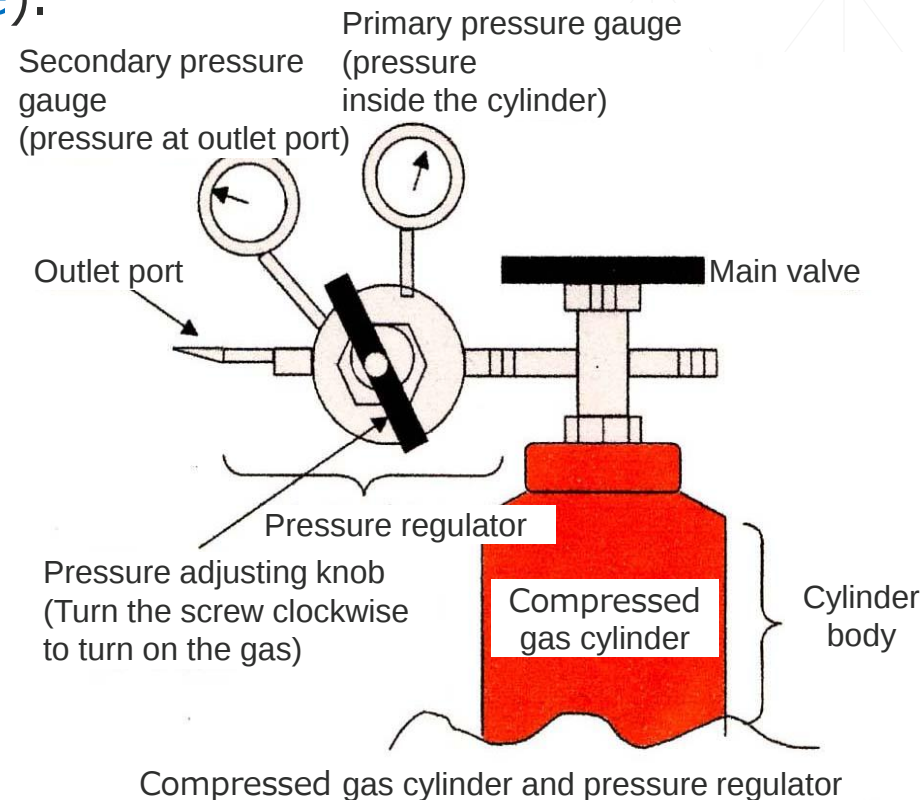
(4) Compressed Gas

2. How to use compressed gas cylinders

To use gas from a compressed gas cylinder, attach a **pressure regulator** and reduce the cylinder pressure (**primary pressure**) to the pressure required for the experiment (**secondary pressure**).

To start gas flow:

- Turn the **main valve** **counterclockwise**.
- Check the **primary pressure gauge**, indicating the **pressure inside the cylinder**.
- Slowly turn the **pressure-adjusting knob** clockwise.
- Set the secondary pressure to the required level.



5. Types of Chemical Substances and Obligations During Use

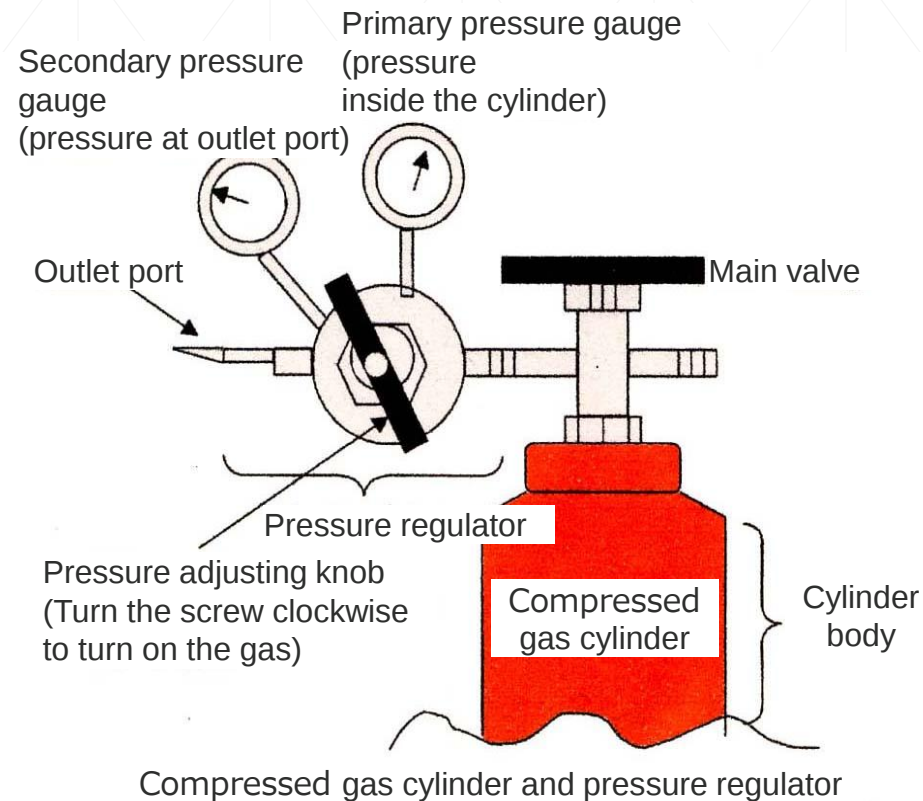
(4) Compressed Gas

2. How to use compressed gas cylinders

When gas is taken from a compressed gas cylinder, attach a **pressure regulator** and reduce the cylinder pressure (**primary pressure** = pressure inside the cylinder) to the experimental pressure (**secondary pressure**).

To stop gas flow:

- Turn the main valve clockwise to close it.
- Release the residual gas in **experimental apparatus** and **pressure regulator**.
- Confirm that the **secondary pressure gauge** returns to **zero**.
- Turn the pressure-adjusting knob counterclockwise until it turns freely.



5. Types of Chemical Substances and Obligations During Use

(4) Compressed Gas

3. Types of compressed gas cylinders

Type	Gas
Flammable gas	hydrogen, acetylene, methane, ammonia, etc.
Oxidizing gas	oxygen, nitrous oxide, chlorine, etc.
Toxic gas	carbon monoxide, hydrogen chloride, ammonia, hydrogen sulfide, hydrogen cyanide, etc.
Inert gas	nitrogen, helium, argon, carbon dioxide, etc.

Common cylinder colors (Learn the colors for frequently used gases)

Gas	Color	Gas	Color
O ₂ gas	Black	Liquefied Cl ₂	Yellow
H ₂ gas	Red	Acetylene gas	Brown
Liquefied CO ₂	Green	Other types of compressed gas	Gray
Liquefied NH ₃	White		



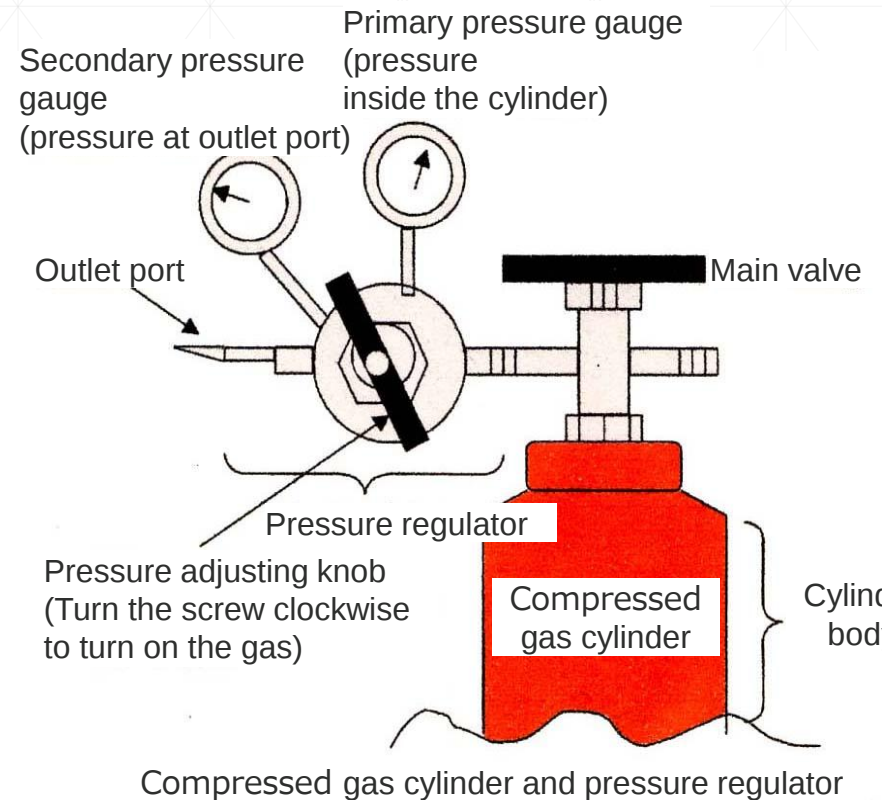
5. Types of Chemical Substances and Obligations During Use

(4) Compressed Gas

4. Important points

- If a **gas leak** is detected—for example, a hissing sound is heard or bubbles appear when soapy water is applied—close the main valve immediately. Contact an experienced staff member or the gas supplier immediately.
- Make sure you understand that turning the **pressure-adjusting knob counterclockwise means closed**.

There have been accidents because people instinctively turn it clockwise when trying to close it.



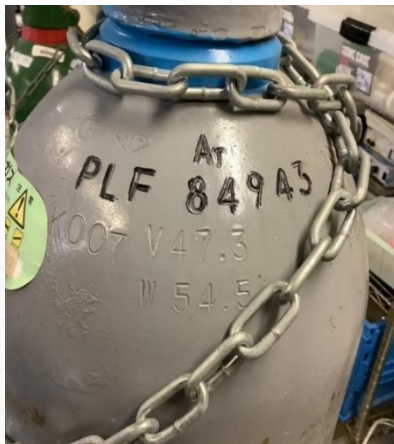
5. Types of Chemical Substances and Obligations During Use

(4) Compressed Gas

5. Management in Chemical Management System

- Register compressed gas cylinders in CMSystem.
- The following information must be registered:
Volume; Storage room; Usage location; Purpose of use;
Rental company; Borrowing date; Product number;
Manufacturing/inspection date; Expiration date

Stamp
on gas cylinders



Gas name; owner registration number; symbol and number;
V = internal volume (L); W/TW = tare weight (kg); year and month of
container inspection; TP = test pressure; FP = filling pressure;
year and month of container re-inspection

5. Types of Chemical Substances and Obligations During Use

(5) Cryogenic liquefied gas

- Cryogenic liquefied gases are characterized by extremely low temperature, a large volume difference between liquid and gas, easy evaporation, and high purity.

The following points must be observed:

- Use dedicated dry leather gloves when touching cold surfaces.
- Wear protective goggles
- Ensure sufficient ventilation when large quantities are used indoors
- Do not close the valves at both ends of the liquid line simultaneously, trapping the liquid in between (liquid seal)

A sealed container may rupture.



N_2 Occupies about 78% of the atmosphere
Boiling point: -196°C
Volume increases by about 700 times,
when liquid N_2 vaporizes



There is a risk of suffocation if the room is not adequately ventilated.

6. Periodic Self-inspection of Chemical Substances (Online inspection)

- Chemical substances must be managed properly in accordance with the relevant laws and regulations.
Failure to do so may lead to serious accidents.
- The Chemical Substance Manager conducts a university-wide periodic self-inspection once a year.
- Periodic self-inspection

Please verify that your laboratory or department properly manages toxic and deleterious substances, high-pressure gases, and hazardous materials in accordance with the chemical management system. (Article 13 of “Miyazaki University Chemical Substance Management Regulations”)
- Since 2022, periodic self-inspections have been conducted online. Enter the required information into the form on the Health Care and Safety Center website.
- The Health Care and Safety Administration Section will announce the inspection schedule by email.

Finally,

please manage chemical substances properly to support safe and productive education and research.

Contact:

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