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# **Manual for handling chemicals (second edition)**

—For SPring-8/SACLA users



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## **Contents**

<b>1. Introduction</b>	<b>1</b>
<b>2. Procedures to be followed before handling chemicals</b>	<b>1</b>
<b>3. Storage and control of chemicals</b>	<b>2</b>
<b>4. Handling of chemicals</b>	<b>4</b>
<b>5. After using chemicals</b>	<b>6</b>
<b>6. In case of accident</b>	<b>6</b>

## 1. Introduction

This textbook provides, in order to ensure the safety of research conducted at SPring-8/SACLA, health and safety knowledge and the rules for the facility users handling chemicals (reagents).

Many of the chemicals used in experiments have hazardous properties. Handle them safely, giving sufficient consideration to health issues, disaster preparedness, theft/loss and environmental pollution.

Principal investigators are responsible for correctly managing chemicals used in their research projects and providing their workers with training for proper handling.

## 2. Procedures to be followed before handling chemicals

Before handling chemicals in research at SPring-8/SACLA, the following procedures are required:

### 1) Carrying in chemicals

Submit the List of Samples, Reagents, etc. online to the Users Office of JASRI no later than 10 days before each visit.

<https://user.spring8.or.jp/apps/login/en?institution=0>

### 2) Entering information on chemical safety when applying for a research project

Enter the properties, hazardousness, safety measures, and other necessary information, as shown in the image below, on all chemicals to be used in the project being applied for by referring to the SDS (MSDS). You will be asked to enter the results of risk assessments as well from B term of 2016 (the second half of FY 2016).

SAMPLE								
Details of Samples (Including substances prepared by SPring-8/SACLA as well as carry-in samples)								
Name of Substance [2]	State/Figure [3]	Qty. & Unit (SI) [4]	Hazards [5]	Purpose of Use [6]	Containment measure and disposal method	Prevention of Hazards	Risk Level [7]	Remarks
Barium Chloride	Powder	100 g	Deleterious Substances	Measurement sample	Avoiding direct sunlight & Being kept in a zipper bag.	Severe weighing control and locked storage to prevent loss and theft.	1/4	COSHH e-tool 1/4:Good working practice and general ventilation
Manganese zinc ferrite	Solid	200mg	Magnetic Substances	Measurement sample	Non	Measurement at room temperature	N/A	
Nickel(II) Oxide	powder	30mg	Specified Chemical Substances	Measurement sample	Encapsulated in a glass capillary.	The sample is always encapsulated in a capillary. When the capillary is broken, we will bring back the sample and broken capillary together.	N/A	
Acetone	Liquid	500ml	Organic solvents & Flammable	Degreasing	Supplied by SPring-8.	Degreasing in a drafter with use of protective gloves.	others	The used risk assessment method is specified by my institute. 4/5&S : Large hazard risk and skin hazard
Chloroform	Liquid	3L	Organic solvents	For fixing a biological sample	The biological samples are encapsulated in containers.	When the container is broken, we will bring back the sample and broken container together.	N/A	
Perchloric Acid	Liquid	500ml	Flammable Substances	Measurement sample	The samples are encapsulated in containers.	Being kept away from fire or a high temperature substance	N/A	
Glycerol	Liquid	300ml	Flammable Substances	Measurement sample	The samples are encapsulated in containers.	Being kept away from fire or a high temperature substance	N/A	
Carbon monoxide	Gas	10ml	Harmful & Flammable Substances	Measurement sample	The samples are encapsulated in containers.	Encapsulated in a diamond anvil cell	N/A	

[2] Avoid abbreviations.

[3] Capillary (powder), Cylinder (gas), Plate (Crystal), metal foil, tablet, bulk, etc.

[4] SI Unit

[5] Categorize the hazard of your sample as Poisonous Substances, Deleterious Substances, Specified Chemical Substances, Organic solvents, Flammable/Explosive Substances, etc. These categories are based on Japanese legal regulations. You can refer the category and properties of your sample via links described in Section "Procedures to be followed in advance by principal investigators" in this page.

[6] Measurement sample, Cleanser, Coolant, Tranquillizer, etc.

[7] Risk assessment result. For details, click here.

### 3) Risk assessment of chemicals

Risk assessment evaluates risks of chemicals to the human body based on the manner in which the chemicals are to be used and considers necessary measures to reduce their risks. This duty has been imposed on each employer that uses chemicals designated by law since June 1, 2016. Chemicals used in experiments conducted in SPring-8/SACLA are subject to risk assessment, which must be carried out by the individual who is going to conduct the experiments. When proposing a research project,

principal investigators are required to enter the results of risk assessments and the safety measures to be taken for each chemical to be used. Safety examination by JASRI refers to such information.

4) Handling narcotics, stimulants, raw materials for stimulants, psychotropics and specified poisonous substances

Before handling such substances, consult the JASRI Safety Office as early as possible, as you must apply for approval to use them (applying for a license and/or certificate) to the government authorities in advance.

**【Inquiries】**

JASRI Safety Office (TEL:0791-58-0874 e-mail:[safety@spring8.or.jp](mailto:safety@spring8.or.jp))

Examples of items requiring special care for use:

- Specific chemicals stipulated by the Act on the Prohibition of Chemical Weapons and the regulation of Specific Chemicals
- Narcotics and psychotropics specified by the Narcotics and Psychotropics Control Law
- Stimulants and their raw materials specified by the Stimulants Control Law
- Hemp and its products specified by the Cannabis Control Law
- Opium, opium poppy, and poppy straw specified by the Opium Law
- Specified drugs stipulated by the Pharmaceutical Affairs Act
- Specified poisonous substances stipulated by the Poisonous and Deleterious Substances Control Law
- Manufacturing-prohibited substances specified by the Industrial Safety and Health Law

Examples of items requiring special care for the transporting method:

- Hazardous materials specified by the Fire Service Act
- Poisonous and deleterious substances

### **3. Storage and control of chemicals**

Chemicals are regulated by related laws and regulations according to their properties. They are also regulated by rules specified by SPring-8/SACLA. Please observe these rules while taking the following measures. There are storage cabinets available in the experimental hall and you can borrow the keys to use them when necessary. Please contact the Beamline Scientist to borrow the keys to control your chemicals in the storage cabinets.

- 1) Narcotics, stimulants, raw materials for stimulants, psychotropics.

Store separately from other reagents in storage cabinets that are always locked, as described in the application submitted to the government authorities. The amounts stored/used for narcotics, stimulants, and raw materials for stimulants should be reported to the government authorities once a year.

Post the following signs on storage containers for narcotics (left) and psychotropics (right).



2) Non-medical poisonous substances (including specified toxic substances), non-medical deleterious substances

- a) Store non-medical poisonous substances separately from other reagents in a locked storage cabinet on which a sign of “医藥用外毒物 (non-medical poisonous substances)” is posted.

医藥用外毒物

Keep records for the amount used and stocked. Store specified toxic substances in designated storage cabinets as described in the application submitted to the government authorities.

- b) Store non-medical deleterious substances separately from other reagents in a locked storage cabinet on which a sign of “医藥用外劇物 (non-medical deleterious substances)” is posted. Keep records for the amount used and stocked.

医藥用外劇物

- c) Post one of the following signs on storage cabinets of poisonous/deleterious substances.

医藥用外毒物

医藥用外劇物

3) Medication

Store poisons and powerful drugs separately from other medication in locked storage cabinets. The following signs must be posted on storage cabinets of poisons (left) and powerful drugs (right).



4) Dangerous substances

Carefully handle flammable substances such as volatile organic solvents and explosive substances that can cause a fire easily and spread a fire leading to great damage. Make sure that the labels indicating “初期消火表示/First extinguisher”, “可燃物/Flammable”, and “爆発物/Explosive” are posted at the entrance to the room where such substances are actually handled. Do not place glass containers such as gallon bottles directly on the floor. When such containers break (when kicked or

hit with a chair, for example), the contents will spread onto the floor, resulting in significant danger to people in the room.. Please take safety measures, such as placing a tray and the like under the containers.

5) Other reagents

Storage and control of other reagents must conform to related laws and regulations. Please control and store them in a manner appropriate to the properties of each reagent.

#### **4. Handling of chemicals**

Many of the chemicals used for experiments have hazardous or dangerous properties. Such chemicals must be handled carefully in a draft chamber. You must be familiar with the properties of chemicals you are going to use prior to experiments.

Chemicals may cause health problems and accidents that involve not only the person actually using them, but others as well. In order to prevent accidents involving chemicals, make sure that you always handle chemicals properly.

When handling chemicals, follow the precautions shown below:

- 1) A beginner must conduct experiments using utmost care, under the guidance of an expert. Experienced persons must perform all experiments carefully, even if they are already very familiar with the procedures.
- 2) Avoid conducting experiments alone.
- 3) Never leave the location of an experiment that is still in progress.
- 4) Learn adequately about the experiment you are going to perform beforehand. Then, check reagents, instruments and your protective gear before starting the experiment.
  - a) Understand all the properties of dangerous chemicals such as combustible/flammable substances, explosive substances, noxious substances and the like by referring to the SDS (MSDS).
  - b) Before conducting an experiment that can cause a fire, prepare a proper fire extinguisher and learn how to use it.
  - c) Avoid wearing clothes, sandals or the like that allow skin to be exposed.
  - d) Always wear goggles (protective glasses) and laboratory coats during experiments. Those who are wearing contact lenses must wear goggles instead of protective glasses when conducting an experiment.
  - e) If necessary, prepare and wear gloves, a face shield, a gas mask and the like.
  - f) Check that experimental equipment is set up in an appropriate manner.
  - g) Glassware and handmade glass equipment often cause injuries; when handling them keep in mind that “broken glass is a potential weapon”. Do not use glass vessels that are cracked or

scratched.

- h) Hazardous chemicals, malodorous reagents or the like that may damage one's health must be handled in a draft chamber. Recover highly poisonous or malodorous reagents after use. When using such substances in the experimental hall (including the experimental hutch), take appropriate measures to prevent them from scattering. In the experimental hutch, take necessary measures to avoid scattering of these substances in case of leakage caused by beam radiation and the like.
  - i) Reagents that might ignite a fire or cause a small explosion shall be handled only in a proper draft chamber made of fire- and explosion-proof materials. If necessary, use a face shield, a protection shield or the like.
  - j) Water-reactive and spontaneously-ignitable chemicals must be handled or stored carefully. Take necessary safety measures. Try to lower risk factors by replacing them with other substances.
  - k) When you must run an experiment all night or temporarily store dangerous substances or the like, take necessary safety measures.
  - l) Waste liquid and solid waste must be classified properly and stored in a cool, dark place while taking safety measures appropriate for the properties of the waste, such as placing a tray under containers of waste liquid.
- 5) As a safety measure, work areas should be free of obstructions in case an earthquake or accident should occur.
- a) Do not leave reagents, instruments, equipment or the like that you do not use on a lab bench, in a draft chamber or the experimental hall (including the experimental hutch).
  - b) Organize reagents separately according to their category and take measures to prevent falls.
  - c) Be considerate of others and keep work areas orderly when using items shared with other laboratories.
- 6) Take measures for prevention of environmental pollution.
- a) Chemicals that might be detrimental to our health or the ecosystem (those stipulated in the PRTR Law, organic solvents/specified chemicals covered by the Industrial Safety and Health Law and the like) must be handled in a draft chamber. When using such substances in small amounts temporarily in the experimental hall and the like, ensure that the place is adequately ventilated. In the experimental hutch, take proper containment measures to prevent chemicals from scattering around in case of leakage caused by beam radiation and the like.
  - b) Prior to using a draft chamber, briefly check that it is properly functioning and that it does not have any broken components.
  - c) Collect waste solutions in a dedicated container and avoid releasing water/liquid used for primary or secondary washing into a sink.
  - d) Only use rotary evaporators with a diaphragm pump or water circulating cooling equipment; do

not use a water aspirator. If a water aspirator is used, volatile substances might be mixed into the waste water.

## **5. After using chemicals**

When finished with chemicals, follow the measures shown below:

1) Clean up thoroughly after every experiment.

Turn off gas outlets, faucets and electrical power after use. Return reagents and equipment to their proper storage locations. Leaving reagents and other items out may cause an accident.

2) If you have vacuum or gas piping in your laboratory, be sure to shut off the main valves after each use.

3) Bring back reagents you brought in, or waste and the like that were produced in your experiments.

## **6. In case of accident**

1) In case of minor abnormalities

When an incident occurs that can be handled by personnel working at the site, follow the measures shown below:

- Judge the situation and follow the necessary measures to prevent the effects from spreading. But take such action only when your safety is ensured.
- Do not handle the incident alone. Always call someone for help.
- Contact the Beamline Toban (PHS: 3899)

2) In case of emergency

When discovering injury to the human body, significant pollution or damage to experimental facilities by chemicals and the like, or when noticing a situation potentially leading to such incidents, follow the measures shown below immediately.

- When the damage may spread, evacuate first. Before evacuating, turn off the electricity and shut off the main gas valves when possible.
- Contact the Beamline Toban (PHS: 3899)
- If you need to call an ambulance or a fire engine, inform the Guard House (emergency call: 119 or 0791-58-0828) and they will guide the emergency vehicles. The Guard House will alert the personnel and the authorities concerned inside and outside the campus.

3) First aid

When a chemical goes into your eyes or comes into contact with your skin, flush the affected area with running water for more than 15 minutes. If you inhale the vapor of a reagent, go outside

immediately and breathe fresh air.

You can see a nurse at the Health Office (ext: 3299, 999) near Large Door D3 of the Storage Ring Facility between 9:00 and 17:30 on week days. When you need to administer first aid, take a first aid kit from near the large door of the Storage Ring Facility or in the area at bottom of stairs in the SACLA Experimental Building.

If you need to call an ambulance, tell the Guard House (emergency calls: 119 or 0791-58-0828) to do so. Also inform the Guard House of the name of the room/building where the injured person is located and describe the injury, which will be reported to the ambulance on arrival.

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**Emergency calls:**

Guard House (ext. 119, 0791-58-0828)

**Inquiries:**

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