

Table 5-1 List of substances that require the use of protective clothes, etc.

| Type 1 substances (specified chemical substances) |   |   |
|---|---|---|
| Dichlorobenzidine and its salts                   | Chlorinated biphenyl (also known as PCB)                        | O-tolidine and its salts  |
| Beryllium and its compounds                       | Benzotrichloride  |   |
| Type 2 substances (specified chemical substance)  |   |   |
| Acrylamide  | Acrylonitrile   | Alkyl mercury compounds (limited to those whose alkyl group is a methyl group or ethyl group) |
| Ethyleneimine                                     | Ortho-toluidine   | Chloroform  |
| Potassium cyanide                                 | Hydrogen cyanide  | Sodium cyanide  |
| Carbon tetrachloride                              | 1,4-dioxane   | 3,3'-dichloro-4,4'-diaminodiphenylmethane   |
| Dichloromethane                                   | Dimethyl-2,2-dichlorovinyl phosphate                            | 1,1-dimethylhydrazine   |
| Methyl bromide                                    | Mercury and its inorganic compounds (excluding mercury sulfide) | Styrene   |
| 1,1,2,2-tetrachloroethane                         | Tetrachloroethylene   | Tolylene diisocyanate   |
| Naphthalene                                       | Nitroglycol   | Para-nitrochlorobenzene   |
| Hydrogen fluoride                                 | Benzene   | Pentachlorophenol   |
| Cyclopentadienyltricarbonyl manganese             | 2-methylcyclopentadienyl manganese tricarbonyl                  | Methyl iodide   |
| Dimethyl sulfate                                  |   |   |

As of August 2017

## 5. Use of hazardous materials

The hazardous materials specified in the Fire Service Act are chemical substances that may cause fire and explosion. The handling is completely different depending on the type of hazardous materials. Fire extinguishing methods are also completely different. When handling hazardous materials, prepare a fire extinguisher, fire extinguishing sand, water, etc. appropriate for these materials.

### [Precautions when handling hazardous materials]

1. Understand the properties of the hazardous materials to be handled
2. Do not use fire
3. Check the position of a fire extinguisher and fire extinguishing sand in preparation for ignition or inflammation
4. Do not place combustibles near hazardous materials in preparation for ignition or inflammation

Hazardous materials are chemical substances whose fire hazards are high. Their handling is regulated by the Fire Service Act. The storage quantity is also limited by the Fire Service Act. This requires precautions. Hazardous materials are classified into six types in the Fire Service Act. Their handling is completely different depending on the type. The fire extinguishing method is also completely different, as shown in Table 2 of Reference Material 3 at the end of this document. Prepare a fire extinguisher, fire extinguishing sand, water, etc. appropriate for the hazardous materials to be handled. There are some chemical substances whose hazards increase by mixing with different types of hazardous materials, as shown in Table 4-1. Table 3 of Reference Material 3 at the end of this document shows the combinations chemical substances that pose hazards of explosion when mixed. In addition to these combinations, there are many chemical substances that pose hazards. Check and handle chemical substances carefully when mixing them.

## [Examples of accidents]

- During disposal of metallic sodium, the material came into contact with water and ignited. Hazardous materials, etc. caught fire, which spread.

## 6. Use of toxic substances specified in the Sewerage Act

Wastewater generated by Kumamoto University is disposed of in accordance with the Sewerage Act (the Water Pollution Control Act for part of wastewater) and the Kumamoto Prefectural Ordinance on Conservation of Groundwater. Chemical substances adhering to apparatuses used in experiments cannot be drained directly into a laboratory sink.

A water aspirator must not be used for these substances. When a circulating aspirator is used, make sure to dispose of water in the storage tank as experiment waste liquids. (Refer to Reference Material 4 at the end of this document.) Failure to do so may result in exceedance of the standard of the Sewerage Act.

- Toxic substances regulated by the Sewerage Act

Cadmium and its compounds, cyanides, organophosphorus compounds, lead and its compounds, hexavalent chromium and its compounds, arsenic and its compounds, mercury and alkyl mercury and other mercury compounds, polychlorinated biphenyls, trichloroethylene, tetrachloroethylene, dichloromethane, carbon tetrachloride, 1,2-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,3-dichloropropene, thiuram, simazine, thiobencarb, benzene, selenium and its compounds, boron and its compounds, fluorine and its compounds, 1,4-dioxane, dioxins, ammonia, ammonium compounds, nitrous acid compounds, and nitric acid compounds

## [Examples of accidents]

- A dichloromethane solution was depressurized using a water aspirator. Dichloromethane was discharged into sewerage together with the water.

## 7. Use of high pressure gases

Understand the types and characteristics of high pressure gases, and handle the gases safely. Notably, avoid impacting containers, and open the valves, etc. slowly. If it is difficult to open or close a container, it may be corroded inside. Do not open or close such a container forcibly. When a container is being used or connected to devices, etc., check for gas leakage as appropriate. After use, close the valve to prevent damage caused by leakage from spreading in the event of an earthquake, fire, etc.

The installation deadline for rental containers (high pressure gas cylinders) is one year from the date of delivery in principle in accordance with the Kumamoto Prefectural Guidelines for Proper Management of High Pressure Gases and Article 8, Item (3) of the Guidelines. Check the return deadline on the empty/full cards hung on cylinders. Return cylinders within one year even if there is remaining gas. However, if a high pressure gas vendor that leases containers confirms safety and gives permission for continued installation, the period can be extended by one year. (For details, refer to "Procedure to extend the installation period of rental containers (high pressure gas cylinders)" in "Manuals/Materials" of YAKUMO.)