

Safety Data Sheet

Polychlorinated biphenyls

Division of Safety
National Institutes
of Health



WARNING!

THESE COMPOUNDS ARE ABSORBED THROUGH THE SKIN AND RESPIRATORY AND INTESTINAL TRACTS. THEY ARE TOXIC, CARCINOGENIC, AND TERATOGENIC. AVOID FORMATION AND BREATHING OF AEROSOLS.

LABORATORY OPERATIONS SHOULD BE CONDUCTED IN A FUME HOOD, GLOVE BOX, OR VENTILATED CABINET. VITON GLOVES ARE RECOMMENDED.

AVOID SKIN CONTACT: IF EXPOSED, WASH WITH SOAP AND WATER.

FOR EYE EXPOSURE, IRRIGATE IMMEDIATELY WITH LARGE AMOUNTS OF WATER. FOR INGESTION, DRINK PLENTY OF WATER AND INDUCE VOMITING. FOR INHALATION, REMOVE VICTIM PROMPTLY TO CLEAN AIR. ADMINISTER RESCUE BREATHING IF NECESSARY. REFER TO PHYSICIAN.

IN CASE OF LABORATORY SPILL, WEAR PROTECTIVE CLOTHING DURING CLEANUP. AVOID SKIN CONTACT OR BREATHING OF AEROSOLS. USE ORGANIC SOLVENT TO DISSOLVE COMPOUND. WASH DOWN AREA WITH SOAP AND WATER. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY.

A. Background

Polychlorinated biphenyls (PCBs) are commercial mixtures of biphenyl with various degrees of chlorination. They vary from mobile, oily liquids to white crystalline solids and hard noncrystalline resins. They are moderately toxic to humans when ingested or absorbed through skin. The main target organs are liver and skin. They are teratogenic but not mutagenic.

B. Chemical and Physical Data

NOTE: Since PCBs are commercial mixtures of varying composition, ranges

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of physical properties are listed below. More specific data on several Aroclors and Kanechlors have been reported (IARC, 1974; Hutzinger et al., 1974).

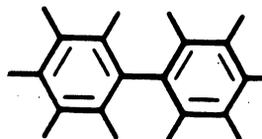
1. Chemical Abstract No.: 1336-36-3

2. Synonyms and trade names:

PCB	Fenclor
Arochlor	Hyvol
Asbestol	Inerteen
Askarel	Kanechlor
Chlophen	Montar Noflamol
Chlorinated biphenyl	Phenochlor
Chlorinated diphenyl	Polychlorinated polyphenyls
Chlorextol	Polychlorobiphenyl
Chlorobiphenyl	Pyralene
Chloro-1,1-biphenyl	Pyranol
CCophen	Saf-T-Kuhl
Diaclor	Santotherm FR
DK	Sovol
Dykanol	Therminol
Elemex	

3. Molecular
formula:
 $C_{12}H_nCl_{10-n}$
weight:
(varies)

structure:



Cl or H at bonds
various degrees of
chlorination; mixtures

4. Specific gravity: 1.18 - 1.81 g/cm³.

5. Absorption spectroscopy: IR, UV, mass, and NMR spectra have been reported (Hutzinger et al., 1974).

6. Vapor pressure: 10⁻³ to 10⁻⁶ mm Hg at room temperature.

7. Solubility: Low in water (solubility decreases with increasing chlorine content); soluble in most organic solvents.
8. Description, appearance: Mobile oil to white solid.
9. Boiling points: 274-475°C; distillable at atmospheric pressure.
10. Stability: Thermally stable except at very high temperature (arcing in transformers), when HCl and toxic products such as polychlorinated dibenzofurans are liberated.
11. Chemical reactivity: Very stable to acid, alkali, and corrosive chemicals. Common reactions (perchlorination, oxidation, nitration, dechlorination) have been reviewed (Hutzinger et al., 1974).
12. Flash points: 140-180°C (open cup) to the boiling point.
13. Autoignition temperature: No data.
14. Flammable limits: Nonflammable, except for lower chlorinated biphenyls.

Fire, Explosion, and Reactivity Hazard Data

1. Fire-fighting personnel should wear air-supplied respirators and full-face masks.
2. There are no unusual fire and explosion hazards.
3. No conditions contributing to instability of PCBs are known.
4. There are no incompatible materials or conditions.
5. At very high temperatures there is formation of HCl and toxic polychlorinated dibenzofurans.
6. Granular PCBs are scattered by development of static charges. (These can be alleviated by use of antistatic sprays and devices.)

Operational Procedures

The NIH Guidelines for the Laboratory Use of Chemical Carcinogens describe operational practices to be followed when potentially carcinogenic chemicals are used in NIH laboratories. The Guidelines should be consulted to identify the proper use conditions required and specific controls to be implemented during normal and complex operations or manipulations involving PCBs.

Viton gloves were superior to other gloves tested for permeability to PCBs (Weeks and McLeod, 1981). If PCBs are in solution, the solvent(s) present may have a substantial effect on glove performance.

1. Decontamination: No validated method reported.
2. Decontamination: Turn off equipment that could be affected by PCBs or the materials used for cleanup. If more than 10 ml has been spilled or if there is any uncertainty regarding the procedures to be followed for decontamination, call the NIH Fire Department (dial 116) for assistance. Rinse surfaces with an organic solvent, then wash with copious quantities of water. Glassware should be rinsed (in a hood) with an organic solvent, followed by soap and water. Animal cages should be washed with water.
3. Disposal: No waste streams containing PCBs shall be disposed of in sinks or general refuse. Surplus PCBs or chemical waste streams contaminated with PCBs shall be handled as hazardous chemical waste and disposed of in accordance with the NIH chemical waste disposal system. Nonchemical waste (e.g., animal carcasses and bedding) containing PCBs shall be handled and packaged for incineration in accordance with the NIH medical-pathological waste disposal system. However, if the dose level in an animal carcass exceeds 50 mg/kg body weight, the medical-pathological waste box in which the carcass is placed for disposal should be labeled "pathological waste containing PCBs" and the Division of Safety should be notified. Potentially infectious waste (e.g., tissue cultures) containing PCBs shall be disinfected by heat using a standard autoclave treatment (particular attention should be given to autoclaving practices to prevent possible PCB aerosolization) and packaged for incineration, as above. If the PCB concentration exceeds 50 ppm total for the medical-pathological waste box, the box should be labeled "pathological waste containing PCBs" and the Division of Safety should be notified. Absorbent materials (e.g., associated with spill cleanup) grossly contaminated shall be handled in accordance with the chemical waste disposal system. Radioactive waste containing PCBs shall be handled in accordance with the NIH radioactive waste disposal system.
4. Storage: Sealed ampoules; amber screw-capped bottles for solid PCBs; screw-capped bottles with Teflon liners for liquid PCBs or solutions.

Monitoring and Measurement Procedures Including Direct Field Measurements and Sampling for Subsequent Laboratory Analysis

1. Sampling: Large airborne particles of PCBs are removed by filtration; small particles and vapor phase PCBs are drawn through impingers charged with organic solvent or are absorbed on polyurethane foam or florisol and subsequently eluted. Water samples collected in glass bottles must be handled rapidly because PCBs adsorb strongly on glass surfaces.
2. Separation and analysis: Air samples are cleaned by means of

solvent extraction, TLC, or column chromatography; water samples are cleaned by concentration and partitioning (extraction or adsorption). The most common analytical method is GC coupled with a microcoulometer and/or electron capture detector (Hutzinger et al., 1974). HPLC offers higher speed and sensitivity (Brinkman et al., 1976).

Biological Effects (Animal and Human)

1. **Absorption:** Because of their high lipid solubility, PCBs are absorbed by epithelial membranes via ingestion, by inhalation, or through skin (Higuchi, 1976).
2. **Distribution:** PCBs are distributed widely in the animal body. The pattern of distribution correlates directly with the lipid content of tissues; highest amounts are in brain and adipose tissue, followed by skin, liver, adrenals, and other organs (Higuchi, 1976).
3. **Metabolism and excretion:** PCBs are hydroxylated both in vivo and in hepatic enzyme preparations. These polar metabolites may be secreted in the bile and eliminated in the feces, excreted by the kidneys, or secreted by the mammary glands (IARC, 1974).
4. **Toxic effects:** In humans, the chief target organs are liver and skin (slightly enlarged liver, acneiform eruptions, hyperpigmentation). Chronic bronchitis is common in massive human exposure. In rodents, the chief effect is on the liver (increase in weight and cell volume); gastric lesions, blood abnormalities, and reproductive disorders have been reported in monkeys. The acute LD50 (oral, rat) varies among individual PCBs between 1 and 11 g/kg. The minimal lethal dose on skin (rabbit) is between 0.8 and 3 g/kg (EPA, 1976).
5. **Carcinogenic effects:** Liver carcinomas have been induced in rats and mice by feeding high doses of PCBs (Kimbrough et al., 1975; EPA, 1976).
6. **Mutagenic and teratogenic effects:** PCBs are nonmutagenic in the Ames test and in animal feeding tests. Oral consumption has resulted in teratogenic effects in dogs, swine, and humans.

Emergency Treatment

1. **Skin and eye exposure:** For skin exposure, remove contaminated clothing and wash skin with soap and water for at least 15 minutes. For eye exposure, irrigate immediately with copious quantities of running water for at least 15 minutes. A drop of vegetable oil may be applied to relieve irritation.
2. **Ingestion:** Drink plenty of water. Induce vomiting.

3. Inhalation: Remove victim promptly to clean air. Administer rescue breathing if necessary.
4. Refer to physician. Consider ophthalmological consultation.

References

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