

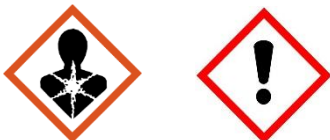
Preventing asthma and sensitization associated with isocyanates



Isocyanates are highly reactive chemicals used in many products, including automotive and aerospace paints, spray polyurethane foams, truck bed liners, glues and adhesives, injection molding, and lacquers.

Products containing isocyanates have several brand or trade names with many different chemical names. The most commonly used isocyanates are methylene bisphenol isocyanate (MDI), toluene (TDI), and hexamethylene (HDI) diisocyanates. You may also find isophorone (IPDI) and naphthalene (NDI) diisocyanates.

To determine whether a product contains isocyanates, read the label and review the safety data sheet (SDS). Look for hazard statements indicating the product may cause skin and eye irritation; allergic skin reaction; allergy or asthma symptoms, or breathing difficulties if inhaled; and respiratory irritation. Also, look for products with two components that must be mixed together. (Typically, one of the products is listed as an activator, hardener, or catalyst.) Hazard pictograms associated with isocyanates are:



Hazardous ingredients

Isocyanates have many chemical formulations. Some of the most common types listed in the hazardous ingredients of safety data sheets include:

TDI

- 2,4,-TDI (CAS: 584-84-9)
- 2,6-TDI (CAS: 91-08-7)
- TDI homopolymer (CAS: 9017-01-0)

MDI

- 4,4'-MDI (CAS: 101-68-8)
- 2,4'-MDI (CAS: 5873-54-1)
- 2,2'-MDI (CAS: 2536-05-2)
- Polymeric MDI (CAS: 9016-87-9)

HDI

- Hexamethylene-1,6-diisocyanate (CAS: 822-06-0)
- HDI Oligomer (CAS: 28182-81-2)
- 1,6-hexamethylene diisocyanate (CAS: 35147-46-7)

IPDI

- Isophorone diisocyanate (CAS: 4098-71-9)

What are the health hazards?

Isocyanates can irritate the eyes, skin, and respiratory system. Exposure to skin can cause a rash, blistering, or burn. The most serious health effects are skin and respiratory sensitization. Exposure through the skin can cause respiratory sensitization. Respiratory sensitization causes isocyanate asthma, which is an asthma-like reaction. Once sensitized, employees can no longer be around isocyanates because a severe reaction could occur, including death. Sensitization is permanent.

Acute symptoms of exposure include eye or skin irritation, skin rash, runny nose, sore throat, coughing, wheezing or shortness of breath, and chest tightness.

Isocyanates other than TDI (toluene diisocyanate) have not been found to cause cancer. TDI is listed as a Group 2B (possible human carcinogen) by the International Agency for Research on Cancer (IARC).

Assessing the risks

Evaluate personal exposures to isocyanates by conducting air and surface sampling, and compare to occupational exposure limits to determine next steps. The Oregon Occupational Safety and Health Division (OR-OSHA) has permissible exposure limits (PELs) for a majority of the isocyanate formulations. The PELs are listed in the Oregon rules for air contaminants in Table Z-2.

Air sampling can be performed using an active pump and specific media (depends on the type of isocyanate). Surface sampling can be conducted using a colorimetric Swype™ indicating pad to determine if isocyanates are present.



How can exposures be prevented?

Substitution

- Use an isocyanate-free product instead of a two-component product with isocyanates.
- Use preformed foam insulation instead of spray foam.

Engineering controls

- Isolate operations from other areas.
- Use a well-ventilated work area such as a spray booth or exhaust ventilation system.
- Brush or roll the product instead of spraying it.
- Use high-volume, low-pressure (HVLP) spray.

Administrative controls

- Restrict access to authorized employees where isocyanate products are being used.
- Limit workers' time near isocyanates.
- Conduct medical monitoring of employees working with isocyanates, including:
 - A medical exam prior to use and annually thereafter
 - Medical removal if sensitization occurs

Personal protective equipment (PPE)

- Cover all exposed skin with a chemical suit.
- Use gloves made from butyl rubber, natural rubber, nitrile rubber, or polyvinyl alcohol.
- Wear goggles or full-face respiratory protection.
- Use respiratory protection with organic vapor cartridge and P100 filter.

Personal hygiene

- Wash skin immediately with soap and water after removing PPE or if you come into contact with isocyanates.
- Decontaminate work surfaces and tools daily that come in contact with isocyanate products.

Train workers

- Recognize hazards and proper procedures when using isocyanate products.
- Understand the health effects and symptoms.
- Use ventilation and PPE.

Resources

CDC NIOSH isocyanate topic page:

www.cdc.gov/niosh/topics/isocyanates/

OSHA Isocyanate topic page:

<https://www.osha.gov/SLTC/isocyanates/index.html>