



UNITED STATES
DEPARTMENT OF LABOR

Occupational Safety & Health Administration

SAFETY AND HEALTH TOPICS

Isocyanates

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Hazard Recognition

Many workers are unaware of the potential hazards that chemicals present in their work environment, which makes them more vulnerable to injury. The following references aid in recognizing and evaluating hazards associated with isocyanates in the workplace.

- [OSHA Technical Manual \(OTM\)](#). OSHA Directive TED 01-00-015 [TED 1-0.15A], (1999, January 20).
 - [Polymer Matrix Materials: Advanced Composites](#). Deals with a segment of the polymer composite industry known as advanced polymer matrix composites, or advanced composites.
- [Chemical Hazard Communication \(PDF\)](#). OSHA Publication 3084, (Revised 1998). Addresses the need for chemical hazard communication and explains why a standard is necessary to minimize workplace hazards.
- [Documentation for Immediately Dangerous to Life or Health Concentrations \(IDLHs\)](#). National Institute for Occupational Safety and Health (NIOSH), (1994, May).
 - [Methyl isocyanate](#)
 - [Methylene bisphenyl isocyanate \(MDI\)](#)
 - [Toluene-2,4-diisocyanate](#)
- [TOXNET \(Toxicology Data Network\)](#). National Library of Medicine.
 - [Methyl Isocyanate](#)
 - [4,4'-Methylenediphenyl Diisocyanate](#)
 - [2,4-Toluene Diisocyanate](#)

- [Report on Carcinogens \(RoC\)](#). US Department of Health and Human Services (DHHS), National Toxicology Program (NTP). Identifies and discusses agents, substances, mixtures, or exposure circumstances that may pose a health hazard due to their carcinogenicity. *The listing of substances in the RoC only indicates a potential hazard and does not establish the exposure conditions that would pose cancer risks to individuals.*
 - [2,4-Toluene diisocyanate](#) (PDF). NTP classification: *Reasonably anticipated to be human carcinogens*
- [International Agency for Research on Cancer \(IARC\) Monographs on the Evaluation of Carcinogenic Risks for Humans](#). World Health Organization (WHO).
 - [4,4'-Methylenediphenyl Diisocyanate \(MDI\)](#) (PDF). IARC Classification: *Not classifiable as to its carcinogenicity to humans (Group 3)*.
- [ToxFAQs™ for Methyl Isocyanate](#). Agency for Toxic Substances and Disease Registry (ATSDR), (2002, April). Summarizes the properties and health effects for methyl isocyanate.
- [Integrated Risk Information System \(IRIS\)](#). Environmental Protection Agency (EPA). Discusses the health effects.
 - [Methyl isocyanate \(CASRN 624-83-9\)](#)
 - [Methylene Diphenyl Diisocyanate \(monomeric MDI\) and polymeric MDI \(PMDI\) \(CASRN 101-68-8, 9016-87-9\)](#)
 - [2,4-/2,6-Toluene diisocyanate mixture \(TDI\) \(CASRN 26471-62-5\)](#)
 - [Health Effects Notebook for Hazardous Air Pollutants](#). Environmental Protection Agency (EPA).
 - [Hexamethylene Diisocyanate](#). CAS No. 822-06-0.
 - [Methyl Isocyanate](#). CAS No. 624-83-9.
 - [4,4'-Methylenediphenyl Diisocyanate \(MDI\)](#). CAS No. 101-68-8.
 - [2,4-Toluene diisocyanate](#). CAS No. 584-84-9.
- [Hazardous Substance Fact Sheets](#). New Jersey Department of Health and Senior Services. Includes detailed reports on specific chemicals, covering hazard summaries, identification, exposure routes, health hazards, and ways of reducing exposure. The following fact sheets cover isocyanate compounds.
 - [3-Chloro-4-Methyl Phenyl Isocyanate](#) (PDF). (1997, April).
 - [Hexamethylene Diisocyanate](#) (PDF). (1999, April).
 - [Isophorone Diisocyanate](#) (PDF). (1986, January).
 - [Methylene Bisphenyl Isocyanate](#) (PDF). (1998, June).
 - [Methyl Isocyanate](#) (PDF). (1996, April).

- [Toluene-2,4-Diisocyanate](#) (PDF). (1996, February).
- [Toluene-2,6-Diisocyanate](#) (PDF). (1996, February).
- [International Chemical Safety Cards \(ICSC\)](#). National Institute for Occupational Safety and Health (NIOSH). Summarizes essential health and safety information.
 - [Hexamethylene Diisocyanate](#)
 - [Isophorone Diisocyanate](#)
 - [Methylene Bisphenyl Isocyanate](#)
 - [Methyl Isocyanate](#)
 - [Toluene-2,4-Diisocyanate](#)
- [Preventing Asthma and Death from Diisocyanate Exposure](#). US Department of Health and Human Services (DHHS), National Institute for Occupational Safety and Health (NIOSH) Publication No. 96-111, (1996). Discusses the recognition, evaluation, and control of diisocyanate exposures.
- *Evaluation of the Effectiveness of Air-Purifying Respirator Cartridges in Removing MDI Aerosols from Air*. The Dow Chemical Company, (1997). Shows that organic vapor cartridges without a particulate filter were not effective at removing Methylene bisphenyl isocyanate (MDI) aerosols from air, while organic vapor cartridges with dust/mist (DM) or high efficiency (HEPA) filters effectively removed greater than 99 percent of MDI aerosol and vapor in all test atmospheres.
- The following studies indicate that respiratory sensitivity to isocyanates may be related to previous dermal exposure.
 - Kimber, I. "The Role of the Skin in Development of Chemical Respiratory Hypersensitivity." *Toxicology Letters* 86(1996): 89-92.
 - Bickis, U., and K. Nakatsu. "A Single Skin Contact with Toluene Diisocyanate (TDI) Causes a One-Year Persistence of Airway Sensitization, Demonstrable in Vivo and in Vitro." (1996). Abstract of platform presentation No. 310 presented at the 1996 American Industrial Hygiene Conference and Exposition.
 - Bickis, U. "Investigation of Dermal Induced Airway Hyperreactivity to Toluene Diisocyanate in Guinea Pigs." Ph.D. thesis, Department of Pharmacology and Toxicology, Queen's University, Kingston, Canada, (1994).
 - Karol, M. H., et al. "Dermal Contact With Toluene Diisocyanate (TDI) Produced Respiratory Tract Hypersensitivity in Guinea Pigs." *Toxicol. Appl. Pharmacol* 58(1981): 221-230.
 - Rattray, N. J., et al. "Induction of Respiratory Hypersensitivity to Diphenylmethane-4,4'-Diisocyanate (MDI) in Guinea Pigs; Influence of route of exposure." *Toxicology* 88(1994): 15-30.

- Deschamps, F., et al. "Mechanisms of Occupational Asthma Induced by Isocyanate." *Ann. Occup. Hyg.* 42(1998): 33-36.
- Cole, K. C., et al. "Flexible Polyurethane Foam. I. FTIR Analysis of Residual Isocyanate." *Applied Polymer Science* 34(1987): 395-407.

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