



# Right to Know Hazardous Substance Fact Sheet

Common Name: **NICKEL OXIDE**

Synonyms: Nickel Monoxide; Nickelous Oxide

Chemical Name: Nickel Oxide

Date: June 1999      Revision: June 2008

CAS Number: 1313-99-1

RTK Substance Number: 3082

DOT Number: UN 3077

## Description and Use

**Nickel Oxide** is a green to black crystalline (sand-like) powder that turns yellow when heated. It is used in paints for porcelain glass colors, fuel cell electrodes, and in the manufacture of glass, stainless, and other alloy steels.

## Reasons for Citation

- ▶ **Nickel Oxide** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS and EPA.
- ▶ This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

## FIRST AID

### Eye Contact

- ▶ Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing.

### Skin Contact

- ▶ Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

### Inhalation

- ▶ Remove the person from exposure.
- ▶ Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- ▶ Transfer promptly to a medical facility.

## EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE BACK PAGE

## Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	4	-
FLAMMABILITY	0	-
REACTIVITY	1	-
CARCINOGEN POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- ▶ **Nickel Oxide** can affect you when inhaled.
- ▶ **Nickel Oxide** is a CARCINOGEN. HANDLE WITH EXTREME CAUTION.
- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Nickel Oxide** can irritate the nose and throat.
- ▶ Inhaling **Nickel Oxide** may cause a sore or hole in the "bone" (septum) dividing the inner nose.
- ▶ **Nickel Oxide** may cause a skin allergy.
- ▶ **Nickel Oxide** may cause an asthma-like allergy.

## Workplace Exposure Limits

The following exposure limits are for *inorganic Nickel compounds* (measured as *Nickel*):

OSHA: The legal airborne permissible exposure limit (PEL) is **1 mg/m<sup>3</sup>** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.015 mg/m<sup>3</sup>** averaged over a 10-hour workshift.

ACGIH: The threshold limit value (TLV) is **0.2 mg/m<sup>3</sup>** (as the *inhalable fraction*) averaged over an 8-hour workshift.

- ▶ **Nickel Oxide** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

## Determining Your Exposure

- ▶ Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- ▶ For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website ([www.nj.gov/health/eoh/rtkweb](http://www.nj.gov/health/eoh/rtkweb)) or in your facility's RTK Central File or Hazard Communication Standard file.
- ▶ You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- ▶ The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

## Health Hazard Information

### Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Nickel Oxide**:

- ▶ Contact can irritate the skin and eyes.
- ▶ Inhaling **Nickel Oxide** can irritate the nose and throat causing coughing and wheezing.

### Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Nickel Oxide** and can last for months or years:

### Cancer Hazard

- ▶ **Nickel Oxide** is a CARCINOGEN in humans. There is evidence that *Nickel compounds* cause lung cancer in humans and they have been shown to cause lung cancer in animals.
- ▶ Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

### Reproductive Hazard

- ▶ According to the information presently available to the New Jersey Department of Health, **Nickel Oxide** has not been tested for its ability to affect reproduction.

### Other Effects

- ▶ Inhaling **Nickel Oxide** may cause a sore or hole in the "bone" (septum) dividing the inner nose.
- ▶ **Nickel Oxide** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- ▶ **Nickel Oxide** may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, coughing, and/or chest tightness.

## Medical

### Medical Testing

For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- ▶ Urine or plasma test for *Nickel* (unexposed persons have urine levels less than **10 micrograms/liter**)
- ▶ Daily urine *Nickel* for several days (persons with urine *Nickel* over **100 micrograms/liter** need medical attention)

If symptoms develop or overexposure is suspected, the following are recommended:

- ▶ Evaluation by a qualified allergist can help diagnose skin allergy.
- ▶ Lung function tests. The results may be normal if the person is not having an attack at the time of the test.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

### Mixed Exposures

- ▶ Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

### Conditions Made Worse By Exposure

- ▶ Persons who are allergic to *Nickel* may also react to *Nickel* coated jewelry, watch bands and sometimes, to prolonged contact with keys, coins, etc.

## Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at [www.cdc.gov/niosh/topics/ctrlbanding/](http://www.cdc.gov/niosh/topics/ctrlbanding/).

The following work practices are also recommended:

- ▶ Label process containers.
- ▶ Provide employees with hazard information and training.
- ▶ Monitor airborne chemical concentrations.
- ▶ Use engineering controls if concentrations exceed recommended exposure levels.
- ▶ Provide eye wash fountains and emergency showers.
- ▶ Wash or shower if skin comes in contact with a hazardous material.
- ▶ Always wash at the end of the workshift.
- ▶ Change into clean clothing if clothing becomes contaminated.
- ▶ Do not take contaminated clothing home.
- ▶ Get special training to wash contaminated clothing.
- ▶ Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- ▶ Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- ▶ Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- ▶ Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.

## Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

### Gloves and Clothing

- ▶ Avoid skin contact with **Nickel Oxide**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- ▶ Safety equipment manufacturers recommend Nitrile and Neoprene for gloves and DuPont Tyvek®, or the equivalent, as a protective material for clothing.
- ▶ All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

### Eye Protection

- ▶ For impact hazards (such as flying fragments, chips or particles), wear safety glasses with side shields or safety goggles.
- ▶ Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

### Respiratory Protection

**Improper use of respirators is dangerous.** Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- ▶ Where the potential exists for exposure under **0.015 mg/m<sup>3</sup>** (as *Nickel*), use a NIOSH approved negative pressure, air purifying, particulate filter respirator. The filter classifications of dust/mist/fume, paint spray or pesticide prefilters, and filters for radon daughters, have been replaced with the N, R, and P series. Each series has three levels of filtering efficiency: 95%, 99%, and 99.9%.
- ▶ Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Nickel Oxide**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- ▶ Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- ▶ Where the potential exists for exposure over **0.015 mg/m<sup>3</sup>** (as *Nickel*), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- ▶ Exposure to **10 mg/m<sup>3</sup>** (as *Nickel*) is immediately dangerous to life and health. If the possibility of exposure above **10 mg/m<sup>3</sup>** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

## Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- ▶ Extinguish fire using an agent suitable for type of surrounding fire. **Nickel Oxide** itself does not burn.
- ▶ **POISONOUS GASES ARE PRODUCED IN FIRE**, including *Nickel Carbonyl*.
- ▶ Use water spray to keep fire-exposed containers cool.

### Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Nickel Oxide** is spilled, take the following steps:

- ▶ Evacuate personnel and secure and control entrance to the area.
- ▶ Eliminate all ignition sources.
- ▶ Moisten spilled material first, or use a HEPA-filter vacuum for clean-up, and deposit in sealed containers.
- ▶ Ventilate and wash area after clean-up is complete.
- ▶ DO NOT wash into sewer.
- ▶ It may be necessary to contain and dispose of **Nickel Oxide** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

### Handling and Storage

Prior to working with **Nickel Oxide** you should be trained on its proper handling and storage.

- ▶ A regulated, marked area should be established where **Nickel Oxide** is handled, used, or stored.
- ▶ **Nickel Oxide** reacts violently with IODINE; HYDROGEN SULFIDE; mixtures of BARIUM OXIDE in AIR or CALCIUM OXIDE in AIR; FLUORINE GAS; and HYDROGEN PEROXIDE to cause a fire and explosion hazard.
- ▶ **Nickel Oxide** is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and ANILINIUM PERCHLORATE.
- ▶ Store in tightly closed containers in a cool, well-ventilated area.

### Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

#### For more information, please contact:

New Jersey Department of Health  
Right to Know  
PO Box 368  
Trenton, NJ 08625-0368  
Phone: 609-984-2202  
Fax: 609-984-7407  
E-mail: [rtk@doh.state.nj.us](mailto:rtk@doh.state.nj.us)  
Web address: <http://www.nj.gov/health/eoh/rtkweb>

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are not intended to be copied and sold  
for commercial purposes.*

## GLOSSARY

**ACGIH** is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

**Acute Exposure Guideline Levels (AEGs)** are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

**Boiling point** is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

**CFR** is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

**DEP** is the New Jersey Department of Environmental Protection.

**DOT** is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

**EPA** is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

**ERG** is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

**Emergency Response Planning Guideline (ERPG)** values are intended to provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

**IARC** is the International Agency for Research on Cancer, a scientific group.

**Ionization Potential** is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

**IRIS** is the Integrated Risk Information System database maintained by federal EPA. The database contains information on human health effects that may result from exposure to various chemicals in the environment.

**LEL or Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

**mg/m<sup>3</sup>** means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

**NFPA** is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

**NIOSH** is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

**NTP** is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

**OSHA** is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

**PEOSHA** is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

**Permeated** is the movement of chemicals through protective materials.

**PIH** is a DOT designation for chemicals which are Poison Inhalation Hazards.

**ppm** means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

**STEL** is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

**UEL or Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

**Vapor Density** is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

Common Name: **NICKEL OXIDE**

Synonyms: Nickel Monoxide; Nickelous Oxide

CAS No: 1313-99-1

Molecular Formula: NiO

RTK Substance No: 3082

Description: Green to black crystalline powder that turns yellow when heated

**HAZARD DATA**

Hazard Rating	Firefighting	Reactivity
<b>4 - Health</b> <b>0 - Fire</b> <b>1 - Reactivity</b> DOT#: UN 3077 ERG Guide #: 171 Hazard Class: 9 (Environmentally Hazardous Substance)	Extinguish fire using an agent suitable for type of surrounding fire. <b>Nickel Oxide</b> itself does not burn. POISONOUS GASES ARE PRODUCED IN FIRE, including <i>Nickel Carbonyl</i> . Use water spray to keep fire-exposed containers cool.	<b>Nickel Oxide</b> reacts violently with IODINE; HYDROXGEN SULFIDE; mixtures of BARIUM OXIDE in AIR or CALCIUM OXIDE in AIR; FLUORINE GAS; and HYDROGEN PEROXIDE to cause a fire and explosion hazard. <b>Nickel Oxide</b> is not compatible with STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC); and ANILINIUM PERCHLORATE.

**SPILL/LEAKS**
**Isolation Distance:**

Spills: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first, or use a HEPA-filter vacuum for clean-up, and deposit in sealed containers.

DO NOT wash into sewer.

**Nickel Oxide** is harmful to aquatic life.

**PHYSICAL PROPERTIES**

<b>Odor Threshold:</b>	Odorless
<b>Flash Point:</b>	Not combustible
<b>Vapor Pressure:</b>	0 mm Hg at 68°F (20°C)
<b>Specific Gravity:</b>	6.67 (water = 1)
<b>Water Solubility:</b>	Insoluble
<b>Melting Point:</b>	3,603°F (1,984°C)
<b>Ionization Potential:</b>	9.5 +/-4 eV
<b>Molecular Weight:</b>	74.7

**EXPOSURE LIMITS**

<b>OSHA:</b>	1 mg/m <sup>3</sup> , 8-hr TWA
<b>NIOSH:</b>	0.015 mg/m <sup>3</sup> , 10-hr TWA
<b>ACGIH:</b>	0.2 mg/m <sup>3</sup> , 8-hr TWA
<b>IDLH:</b>	10 mg/m <sup>3</sup>
(All of the above are for <i>inorganic Nickel compounds</i> measured as <i>Nickel</i> )	

**PROTECTIVE EQUIPMENT**

<b>Gloves:</b>	Nitrile and Neoprene (>8-hr breakthrough)
<b>Coveralls:</b>	DuPont Tyvek®
<b>Respirator:</b>	<0.015 mg/m <sup>3</sup> - APR with High efficiency filter >0.015 mg/m <sup>3</sup> - Supplied air

**HEALTH EFFECTS**

<b>Eyes:</b>	Irritation
<b>Skin:</b>	Irritation, itching and skin rash
<b>Inhalation:</b>	Nose and throat irritation with coughing and wheezing
<b>Chronic:</b>	<i>Nickel compounds</i> cause lung cancer in humans

**FIRST AID AND DECONTAMINATION**

<b>Remove</b>	the person from exposure.
<b>Flush</b>	eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn.
<b>Quickly</b>	remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.
<b>Begin</b>	artificial respiration if breathing has stopped and CPR if necessary.
<b>Transfer</b>	to a medical facility.