

Nickel Nanostrands

1. Chemical Composition

C.A.S. Number Nickel 7440-02-0
 EINECS Number Nickel 2311114

	Calculated Composition	OSHA/PEL mg/m ³	ACGIH/TLV mg/m ³
Nickel (Ni)	100%	1	1.5

2. Hazards Identification

Nickel

LD₅₀ ORAL RAT >9000 mg/kg

Inhalation: In 1997, the ACGIH categorized elemental nickel as: A5 "Not Suspected as a Human Carcinogen". Epidemiological studies of workers exposed to nickel powder and to dust and fume generated in the production of nickel alloys and of stainless steel have not indicated the presence of a significant respiratory cancer hazard. The inhalation of nickel powder has not resulted in an increased incidence of malignant lung tumors in rodents.

Inhalation of nickel may induce asthma. This effect is rare, it has been reported in welders where exposures to nickel are often mixed with other chemical substances. Persons with a known history of nickel sensitive asthma should avoid such contact.

The National Toxicology Program has listed nickel as reasonably anticipated to be a carcinogen based on the production of injection site tumors. The International Agency for Research on Cancer (IARC) found that there was inadequate evidence that metallic nickel is carcinogenic to humans but since there was sufficient evidence that it is carcinogenic to animals, IARC concluded that metallic nickel is possibly carcinogenic to humans.

Evidence for the association of nickel compound exposures and cancer risk comes mainly from workers in now obsolete nickel refining operations where very high concentrations of airborne nickel, mostly present as oxidic or sub-sulphidic species at up to 100 mg/m³ or more, were associated with excess nasal and lung cancers. The inhalation of nickel powder has not resulted in an increased incidence of malignant lung tumors in rodents. Repeated intratracheal instillation of nickel powder produced an increased incidence of malignant lung tumors in rats. Repeated intratracheal instillation of nickel powder did not produce an increased incidence of malignant lung tumors in hamsters when administered at the maximum tolerated dose. Single intratracheal instillations of nickel powder in hamsters at doses near the LD₅₀ produced an increased incidence of fibrosarcomas, mesotheliomas and rhabdomyosarcomas. Inhalation of nickel powder at concentrations 15 times the TLV irritated the respiratory tract in rodents.

Skin Contact: Prolonged and intimate contact with metallic nickel may cause irritation to the skin and nickel sensitivity which may result in allergic skin rashes.

Wounds: Nickel metal powder has caused tumors at the site of injection in rodents. However, studies do not suggest a significant risk for humans from nickel-containing prostheses.

- Ingestion:** The U.S. National Institute for Occupational Safety and Health (NIOSH) concluded there is no evidence that nickel and its inorganic compounds are carcinogenic when ingested. The U.S. Food and Drug Administration has affirmed that nickel is generally recognized as safe (GRAS) as a direct human food ingredient.
- Preexisting Conditions:** Prolonged and intimate skin contact can cause an allergic skin rash in previously sensitized individuals.
- Reproductive Toxicity:** Animal experiments indicate that soluble nickel ingestion causes adverse effects on fetal development at a threshold oral exposure of 2.2 mg/ Ni/kg/day by pregnant rats. Data are insufficient to determine if this effect occurs in humans and no regulatory agency has classified soluble forms of nickel as reproductive risks for humans.
- o California Proposition 65
 - a NSRL (No Significant Risk Level) has not been adopted for nickel hydroxide as a carcinogen
 - a MADL (Maximum Allowable Dose Level) has not been adopted for nickel hydroxide as a chemical causing reproductive toxicity
 - “Nickel and certain nickel compounds” is on the Second Priority List for NSRL Development
 - Nickel hydroxide is not on any Priority List for MADL Development

3. Precautions for Safe Handling and Use

Do not inhale nanostrands. If user operations generate dust, mist or fume, use ventilation to keep exposure to airborne nickel below the exposure limit. If ventilation alone cannot so control exposure, use NIOSH-approved respirators selected according to OSHA 29 CFR 1910.134. Maintain airborne nickel levels as low as possible. Ventilation is normally required when handling or using this product to keep airborne nickel below the nationally authorized limits. If ventilation alone cannot control exposure, use respirators nationally approved for the purpose.

Avoid repeated skin contact. Wear suitable gloves. Wash skin thoroughly after handling. Launder clothing and gloves as needed. Do not store near acids. Like other metals, nickel can react with acids to liberate hydrogen gas which can form explosive mixtures in air.

Do not store near acids or reactive substances. Finely-divided nickel metal may react explosively or incandescently with substances such as ammonium nitrate, perchlorates, phosphorous, etc. Under special conditions nickel can react with carbon monoxide in reducing atmospheres to form nickel carbonyl, Ni(CO)₄, a toxic gas. Finely divided nickel particles heat treated in a reducing atmosphere may become spontaneously combustible.

Keep in the container supplied and keep container closed when not in use.

4. Spill, Leak, and Disposal Procedure

Collect spills or dust by wet sweeping or by vacuuming with the vacuum exhaust passing through a high efficiency particulate arresting (HEPA) filter if the exhaust is discharged into the workplace. Wear appropriate NIOSH-approved respirators if collection and disposal of dust is likely to cause the concentration of airborne contaminants to exceed the exposure limits.

Nickel-containing waste is normally collected to recover nickel values. Should waste disposal be deemed necessary follow EPA and local regulations.

5. Emergency and first aid procedures

For skin rashes, seek medical attention. If exposure to nickel carbonyl is suspected, seek medical attention immediately. Cleanse wounds thoroughly to remove any particles.

American Association of Poison Control Centers: 1-800-222-1222

6. SARA Section 313 Supplier Notification

This product contains the following chemical(s) subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40 CFR 372:

Nickel

Refer to the Hazardous Ingredients section of this MSDS for the appropriate CAS numbers and percent by weight.

7. Physical and Chemical Properties

Description: Dark colored (black or gray) spongy powder

Molecular Weight	58.71
Magnetic Properties	Ferromagnetic
Viscosity	N/A
Melting point Ni	1453 ^o C
Boiling point Ni	2732 ^o C
Flash Point	N/A
Autoflammability	N/A
Explosive properties	N/A
Vapour pressure	N/A
Density Ni	8.91 g/cm ³
Solubility	N/A
Partition coefficient	N/A

N/A: Not Applicable

This product is Stable.

This product can react vigorously with acids to liberate hydrogen which can form explosive mixtures with air. Under special conditions nickel can react with carbon monoxide in reducing atmospheres to form nickel carbonyl, Ni(CO)₄, a toxic gas.

8. Transport Information

International Maritime Dangerous Goods Code: Not regulated.

International Civil Aviation Organisation Technical Instructions for the Carriage of Dangerous Goods by Air: Not regulated.

U.S. Dept. of Transportation Regulations: Not regulated.

Canadian Transportation of Dangerous Goods Act: Not regulated.

European Agreement Concerning the International Carriage of Dangerous Goods by Road: Not regulated.

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