



Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Material Type: Nickel Oxide
Synonyms: Nickel monoxide, Nickelous Oxide
Product Names: **Nickel Oxide Nanoparticles**

CAS-No.: 1313-99-1
SKU: SP23065

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Catalysts, Solar cells, Fuel cells, Frit Glass, nickel based powders from nickel oxide, nickel-containing electronics and thermally functioning ceramics, nickel-containing pigments, nickel-containing glass, Stainless, special steels and special alloys manufacturing

1.3 Details of the supplier of the safety data sheet

Company:
Accurate Atom Inc.
1425 W. Lincoln HWY
DeKalb, Illinois, 60115
www.accurateatom.com
Tech@accurateatom.com

1.4 Emergency telephone number

Emergency Contact: Accurate Atom
Telephone: (630) 659-5999

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Skin Sensitization - Category 1;
Respiratory Sensitization - Category 1;
Carcinogenicity- Category 1 A;
Specific Target Organ Toxicity, Repeated exposure - Category 1
Aquatic Chronic - Category 4

2.2 GHS Label elements, including precautionary statements

Product Identifier: Nickel Oxide
CAS No.: 1313-99-1



Pictogram GHS07 GHS08

Signal word Danger

Hazard statement(s)

H317 May cause an allergic skin reaction.
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H350 May cause cancer.
H372 Causes damage to organs through prolonged or repeated exposure.
H413 May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing dust/fumes/gas/mist/vapors/spray.
P273 Avoid release to the environment.
P281 Use personal protective equipment as required.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P501 Dispose of contents/ container to an approved waste disposal plant.

(NOTE: number of P-statements has been reduced, as per CLP regulation, the full list can be found in Section 15).

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS – none

May cause long lasting harmful effects to aquatic life

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Hazardous Ingredients	Typical Composition	C.A.S. Number	EINECS/EC Label No.
Nickel Oxide	>99%	1313-99-1	215-215-7
Nickel Hydroxide	0.0 – 1.0%	12054-48-7	235-008-05

4. FIRST AID MEASURES

4.1 Description of first aid measures

- Ingestion: No specific first aid required.
- Inhalation: No specific first aid required.
- Skin: Remove contaminated clothing, and wash affected areas thoroughly with soap and water. If skin irritation or rash occurs: Get medical advice/attention. Show label if possible.
- Eyes: Irrigate eyeball thoroughly with water for at least 10 minutes. If discomfort persists seek medical attention.

4.2 Most important symptoms and effects, both acute and delayed

- Skin contact: Rash
Eye contact: Redness

4.3 Indication of any immediate medical attention and special treatment needed

No special requirements

5. FIREFIGHTING MEASURES

5.1 Suitable Extinguishing Media

Any, type to be selected according to materials in the immediate neighborhood.

5.2 Special Risks

Non-Flammable. Extinguish surrounding fires with appropriate methods

5.3 Special Protective equipment for fire fighting

None needed. Wear protective equipment if required for other materials within immediate vicinity.

5.4 NFPA Rating

Health hazard: 2
Fire Hazard: 0
Reactivity Hazard: 0

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid generation of dusty atmospheres. Do not inhale dusts. Contaminated work clothing should not be allowed out of the workplace. Use personal protective equipment as required. Wash hands, and face thoroughly after handling.

6.2 Environmental precautions

Spillages and uncontrolled discharges must be prevented from entering waterways.

6.3 Methods and materials for containment and cleaning up

Pick up and replace in original container. Nickel-containing material is normally collected to recover nickel values.

6.4 Reference to other sections

For disposal see section 13.

7. **HANDLING AND STORAGE**

7.1 **Precautions for safe handling**

Prevent the generation of inhalable dusts e.g. by the use of suitable ventilation. Do not inhale dust. Wear appropriate nationally approved respirators if handling is likely to cause the concentration limits of airborne nickel to exceed the locally prescribed exposure limits. Wear suitable protective clothing and gloves. Contaminated work clothing should not be allowed out of the workplace.

7.2 **Conditions for safe storage, including any incompatibilities**

Keep in the container supplied, and keep container closed when not in use. Local regulations should be followed regarding the storage of this product.

8.0 **EXPOSURE CONTROLS / PERSONAL PROTECTION**

8.1.1 **Exposure Limits**

Nickel Oxide (NiO) – CAS 1313-99-1		
	Exposure Limit (mg/m ³)	Year
ACGIH TLV-TWA ¹	0.2 ** as Ni	2012
UK WEL ²	0.5 as Ni	2011
Japan	1 as Ni	2012
Korea	0.1 as Ni	2006
China	1 as Ni	2007

* Inhalable fraction

+ Insoluble inorganic fraction

8.1.2 **Environmental Limits**

PNEC's

Compartment	Unit	PNEC
Freshwater	µg Ni/L (bioavailable)	3.55
Marine	µg Ni/L	8.6
Terrestrial	mg Ni/kg	29.9

DNEL's

	Unit	DNEL
Dermal		
Acute systemic	mg Ni/kg/day	-
Acute local	mgNi/cm ² /day	-
Long-term systemic	mg Ni/kg/day	-
Long-term local	mgNi/cm ² /day	0.024
Inhalation		
Acute systemic	mgNi/m ³	520
Acute local	mgNi/m ³	3.9 ¹
Long-term systemic	mgNi/m ³	0.05 ²³
Long-term local	mgNi/m ³	0.05 ²³

¹ Based on MMAD of 2.9 µm, increases with increasing MMAD (estimated as ≥6.4 mg Ni/m³ for exposures to particles with a MMAD of ≥30 µm.

²When handling powders of particle aerodynamic equivalent diameter (AED) below 10 µm, exposures (8h TWA) to these powders should be kept under 0.01 mg Ni/m³•

³ When exposure are solely to metallic and nickel oxides (without exposure to any other nickel compounds) and the mean particle size of the aerosol is greater than 10 µm AED (≤ 10% of aerosol mass in respirable fraction), inhalable exposure levels up to 0.2 mg Ni/m³ could be reasonably assumed to be safe.

8.2 Exposure controls

Do not inhale dust. Mechanical extraction ventilation may be required if user operations change it to other physical or chemical forms, whether as end products, intermediates or fugitive emissions, which are inhalable. Maintain airborne nickel levels as low as possible. Avoid repeated skin contact.

PPE

Respiratory protection: If required, use an approved respirator with particulate filters.

Eye protection: If required.

Hand & Skin Protection: Wear suitable protective clothing and gloves, which should be selected specifically for the working place, depending on concentration and quantity of the hazardous material (overalls and leather/rubber gloves). Wash skin thoroughly after handling and before eating, drinking or smoking. Change contaminated clothing frequently. Launder clothing and gloves as needed. Use of skin-protective barrier cream advised.

9. PHYSICAL AND CHEMICAL PROPERTIES

Solid granular dark gray material

Physical state at 20°C and 101.3 kPa	Solid
Melting / freezing point	>1900°C
Boiling point	Not applicable
Relative Density	6.75 g/cm ³ at 25°C
Vapor Pressure	Not applicable
Surface Tension	Not applicable
Water Solubility	3.52X10 ⁻⁵ g/l at 20°C (green nickel oxide) 2.26X10 ⁻³ g/l at 20°C (black nickel oxide)
Partition Coefficient n-octanol/water (log value)	Not applicable
Flash Point	Not applicable
Flammability	Non-flammable
Explosive Properties	Non-explosive
Self-ignition temperature	>400°C
Oxidizing Properties	Non-oxidizing
Granulometry	Particle Size: <0.1 micron
Stability in organic solvents and identity of relevant degradation products	Not applicable
Dissociation Constant	Not applicable
Viscosity	Not applicable

10. STABILITY AND REACTIVITY

10.1 Reactivity

Stable under normal conditions.

10.2 Chemical stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

Stable under normal conditions.

10.4 Conditions to avoid

None.

10.5 Incompatible materials

None.

10.6 Hazardous decomposition products

No information available

11. TOXICOLOGICAL INFORMATION

As a mixture the toxicological properties of this product are unknown. The toxicology of the reported ingredients are summarized below.

Nickel Oxide

Acute toxicity

Oral:	Nontoxic – LD ₅₀ ORAL RAT > 11,000 mg/kg (green); 9,990 (black)
Inhalation:	Nontoxic – LD ₅₀ INHAL RAT >5.08 mg/m ³ (green); >5.15 mg/m ³ (black)
Dermal:	No information available.

Corrosivity/Irritation

Respiratory Tract	No classification.
Skin	Not corrosive/irritating.
Eyes	Mildly irritating.

Sensitization

Respiratory Tract	No information available.
Skin	Ni oxide is currently classified as a dermal sensitizer (R43) according to the 1st ATP to the CLP Regulation. Recent studies evaluating the bio accessibility of a series of Ni compounds in synthetic sweat indicated very low nickel ion release from Ni oxide suggesting very low or no sensitization potency. Early Guinea pig maximization and Beuhler test results show low potential for nickel oxide to act as a dermal sensitizer.

Pre-existing conditions	Individuals known to be allergic to nickel should avoid contact with nickel whenever possible to reduce the likelihood of nickel allergic contact dermatitis reactions (skin
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rashes). Repeated contact may result in persistent chronic palmar/hand dermatitis in a smaller number of individuals, despite efforts to reduce or avoid nickel exposure.

Chronic toxicity

Oral: No information available

Inhalation: Exposure related toxicities were noted following 13 weeks and two years of exposure to NiO in both rats and mice in the US NTP chronic rat inhalation study. Adverse effects in rodents were primarily limited to the lung (e.g., increased tissue weight, inflammation, macrophage hyperplasia). The LOAEC from the chronic study in rats was 0.6 mg NiO/m³ or 0.5 mg Ni/m³•

Dermal: No information available.

Mutagenicity / Reproductive toxicity

Not classified for reproductive/developmental toxicity. Not classified for mutagenicity.

Carcinogenicity

Ingestion: No information available. Not classified.

Inhalation: Cat. 1 A; Human epidemiological and animal data suggest that at least some forms of nickel oxide can be carcinogenic to the respiratory tract of humans after inhalation.

Nickel Hydroxide No information currently available.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Aquatic Chronic 4. May cause long lasting harmful effects to aquatic life.

12.2 Persistence and degradability

No information available.

12.3 Bio accumulative potential

No information available.

12.4 Mobility in soil

The substance is essentially insoluble in water.

12.5 Results of PBT and vPvB assessment

Not classified as PBT or vPvB.

12.6 Other adverse effects

None anticipated.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Recover or recycle if possible. Dispose of contents in accordance with local, state or national legislation.

13.2 Additional Information

No information available.

14. TRANSPORT INFORMATION

International Maritime Dangerous Goods Code	Not Regulated
International Civil Aviation Organization 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

15. REGULATORY INFORMATION

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS
Nickel Oxide	X	X	-	215-215-7	-

Component	NLP	PICCS	ENCS	AICS	IECSC	KECL
Nickel Oxide		X	X	X	X	X

- X Listed
- E Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
- F Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
- N Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
- P Indicates a commenced PMN substance
- R Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
- S Indicates a substance that is identified in a proposed or final Significant New Use Rule
- T Indicates a substance that is the subject of a Section 4 test rule under TSCA.
- XU Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).
- Y1 Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
- Y2 Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nickel oxide	1313-99-1	>99	0.1

SARA 311/312 Hazardous Categorization

Acute Health Hazard Yes
 Chronic Health Hazard Yes
 Fire Hazard No
 Sudden Release of Pressure Hazard No
 Reactive Hazard No

Clean Water Act Not applicable

Component	CWA-Hazardous Substances	CWA – Reportable Quantities	CWA – Toxic Pollutants	CWA – Priority Pollutants
Nickel Oxide	-	-	X	-

Clean Air Act Not applicable

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Nickel Oxide	X		-

OSHA Occupational Safety and Health Administration

Not applicable

CERCLA

Not applicable

California Proposition 65

This product contains the following Proposition 65 chemicals:

Component	CAS-No	California Prop. 65	Prop. 65 NSRL	Category
Nickel Oxide	1313-99-1	Carcinogen	-	Carcinogen

State Right-to-Know

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nickel Oxide	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): N

DOT Marine Pollutant: N

DOT Severe Marine Pollutant: N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations**Mexico - Grade**

No information available

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class

D2A Very toxic materials
D2B Toxic materials

Hazard statement(s)

H317	May cause an allergic skin reaction.
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H350	May cause cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/fume/gas/mist/vapors/spray.
P261	Avoid breathing dust/fumes/gas/mist/vapors/spray.
P264	Wash hands and face thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P281	Use personal protective equipment as required.
P284	Wear respiratory protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P342 + P311	If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.
P314	Get medical advice/attention if you feel unwell.
P321	See Safety Data Sheet for specific treatment.
P363	Wash contaminated clothing before reuse.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

Disclaimer This information is based upon the present state of our knowledge. This SDS has been compiled and is solely intended for this product