

Section 1 Identification

Product Name: CenterLine® Cold Spray Feedstock Powder – Nickel-Aluminum-Zinc-Aluminum Oxide
Product Numbers: SST-N0056, SST-N0057, SST-N0058
Synonyms: Ni-Al-Zn-Al₂O₃ Blend
Recommended Use: Low Pressure Cold Spray
Manufacturer: CenterLine (Windsor) Ltd, 415 Morton Drive, Windsor, Ontario N9J 3T8, Canada
US Office: 1985 Ring Drive, Troy MI 48083, USA
General Information: T:519-734-8464 / F:519-734-2000 / Email: info@cntrline.com
Emergency: 800-423-0367 / 519-259-4307

Section 2 Hazard(s) identification**Classification of the Substance****Regulation (EC) No.1272/2008 (CLP)**

Skin Sens. 1: H317
Carc. (inhal) 2: H351
STOT RE (inhal.) 1: H372
Aquatic chronic 3: H412

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Skin sensitization (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), H372
Chronic aquatic toxicity (Category 3), H412

Label Elements**Regulation (EC) No.1272/2008 (CLP)****Pictogram(s):****Signal word: DANGER****Hazard statement:**

H317 - May cause an allergic skin reaction
H351 - Suspected of causing cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure by inhalation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements:

P260 - Do not breathe dust/fume/gas/mist/vapours/spray
P273 - Avoid release to the environment
P281 - Use personal protective equipment as required
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water.
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention.

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**Pictogram(s):****Signal Words: WARNING****Hazard Statements:**

H317 - May cause an allergic skin reaction.
H351 - Suspected of causing cancer.
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled.



H412 - May cause long lasting harmful effects to aquatic life.

Precautionary statements:

- P264 - Wash hands thoroughly after handling.
- P261 - Avoid breathing dust/fume/gas/mist/vapors/spray.
- P270 - Do not eat, drink or smoke when using this product.
- P273 - Avoid release to the environment.
- P284 - Wear respiratory protection.
- P301 + P330 - IF SWALLOWED: Rinse mouth with water.
- P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
- P314 - Get Medical advice/attention if you feel unwell.
- P333 + P313 - If skin irritation or rash occurs: Get medical advice/ attention.
- P363 Wash contaminated clothing before reuse

Section 3 Composition/information on ingredients

Ingredients	CAS Number	EINECS NO.	% WT	OSHA-PEL	ACGIH-TLV
Ni	7440-02-0	231-111-4	10-50	1.0 mg/m ³	1.5 mg/m ³ (Dust)
Al	7429-90-5	231-072-3	10-30	15 mg/m ³ (Total) 5 mg/m ³ (Resp)	1 mg/m ³
Zn	7440-66-6	231-175-3	10-50	5 mg/m ³ (Fume)	5 mg/m ³ (Fume)
Al ₂ O ₃	1344-28-1	215-691-6	10-40	15 mg/m ³ (Total) 5 mg/m ³ (Resp)	1 mg/m ³ (as Al, Resp)

Section 4 First-aid measures

- Skin:** Gently brush away excess chemical quickly, then wash with water and soap. If irritation develops and persists, seek medical attention.
- Eyes:** Rinse with large amounts of water for at least 15 minutes, and then seek medical attention. Contact lenses should not be worn while handling this material.
- Inhalation:** Remove the person to fresh air, and if problems with breathing still persist supply respiratory support. If they are not breathing perform artificial respiration. Seek medical attention.
- Ingestion:** Rinse mouth with water and then get medical attention immediately. Do not induce vomiting unless directed to do so by medical personnel.

Section 5 Fire-fighting measures

- Flammable Conditions:** Non-Flammable. May oxidize to Nickel Oxide if exposed to high temperatures within a fire. Keep containers cool with water spray.
- Means of Extinction:** Apply dry chemical, dry sand, or special powder extinguishing (Class D) media. Do NOT use water, carbon dioxide or foam on molten metals. Water may be ineffective for extinguishing a fire but should be used to keep fire exposed billets, ingots and castings cool.
- Hazardous Combustion Products:** Nickel oxide fume, carbon dioxide and carbon monoxide, hydrogen, toxic fumes of ZnO
- Special Fire Fighting Procedures:** Avoid water, halogenated extinguishing agents. Avoid generation of dust. Cover to eliminate oxygen. Isolate burning material with ring of dry sand or Type D extinguishment. Do not disturb burning powder until completely cool. Use of ABC rated extinguishers may accelerate fire.
- Unusual Fire and Explosion Hazards:** May oxidize to nickel oxide if exposed to high temperatures within a fire. Under special conditions nickel can react with carbon monoxide in reducing atmospheres to form Nickel Carbonyl, Ni(CO)₄, a toxic gas. Metal powders when heated in reducing atmospheres may become pyrophoric. Aluminum reacts with water, acids, and alkalis to produce hydrogen. Dust/air mixture may explode violently when ignited. High heat of fire may cause underlying concrete to fracture. Dust/Fines in contact with metal oxides (e.g. rust) may present hazard of a thermite reaction. Dust/fines in contact with water may generate hazardous quantities of flammable/explosive hydrogen gas. Avoid risk of secondary explosion by limiting accumulations of fugitive dust. Zinc oxide fume may result from combustion of zinc dust.

Explosivity Characteristics (Aluminum constituent)	
Minimum Ignition Temperature (MIT):	650 °C (cloud)



	760 °C (layer)
Minimum Explosible Concentration (MEC)	45 - 120 gm/m ³
Minimum Ignition Energy (MIE)	4 - 13 mJ
Deflagration Index (K_{st})	90 – 300 bar-m/sec
Explosivity Characteristics (Zinc constituent)	
Minimum Ignition Temperature (MIT):	460 °C (cloud) 690 °C (layer)
Minimum Explosible Concentration (MEC)	300 gm/m ³
Minimum Ignition Energy (MIE)	960 mJ
Deflagration Index (K_{st})	0 – 200 bar-m/sec
<i>Note: These values may vary with particle size. Refer to NFPA 484 for further data for specific particle sizes.</i>	

Section 6 Accidental release measures

Clean-Up Procedures: Reseal container. Remove all sources of ignition. Prohibit smoking in area. Use non-sparking conductive tools to transfer spilled material to a leak-proof container. Brushes/Brooms should have natural bristles. Avoid synthetic materials. Avoid generation of dust cloud during clean-up. Ensure adequate ventilation. Avoid inhalation of dust and fumes. Wear suitable protective equipment. Place in a suitable container for recycling or disposal in accordance with local, state and federal laws.

Personal precautions, protective equipment and emergency procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition. Refer to Section 8.

Environmental precautions: Do not allow to enter drains or to be released to the environment. Refer to Section 12.

Section 7 Handling and storage

Safe handling procedure: Avoid contact with your eyes and skin. Do not ingest the product. Carry the product in a closed container. Wear appropriate personal protection, see Section 8.

Hygienic Practices: Wash hands thoroughly after handling, and before eating or smoking. Smoking and consumption of food or beverages should be restricted from areas where hazardous dust or chemical may be present. Do not shake clothing, rags, or other items to remove dust. Dust should be removed by laundering or vacuuming (with appropriate filters) the clothing, rags, or other items.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Store in cool, dry, well ventilated place away from heat, direct sunlight, strong oxidizers and any incompatibles. Store in approved containers and protect against physical damage. Keep containers securely sealed when not in use. Indoor storage should meet OSHA standards and appropriate fire codes. Containers that have been opened must be carefully resealed to prevent leakage. Empty containers retain residue and may be dangerous. Avoid water contamination.

Section 8 Exposure controls/personal protection

Exposure Limits: Refer to Section 3.

Appropriate engineering controls: Local exhaust ventilation or process enclosure. In order to understand the type of controls needed to keep dust levels below OSHA PEL's and ACGIH TLV's the ACGIH manual "Industry Ventilation" can be helpful. An emergency eye bath and deluge shower meeting ANSI should be provided.

Individual protection measures:

Gloves: Wear any liquid-tight gloves such as butyl rubber, neoprene or PVC. A gauntlet type glove or long sleeve shirt should also be worn if skin contact is probable and skin is sensitive.

Respiratory Protection: For protection in normal use, where particulate concentrations do not reach IDLH conditions, a Full Face piece, Positive-Pressure or Pressure-Demand, Supplied-Air Respirator (SAR) or Airline Respirator is recommended. For IDLH or Hazardous situations a Helmet/Hood or Full Face piece, Pressure-Demand or Positive-Pressure, Self-Contained Breathing Apparatus is recommended. Respirator selection is determined based on air born particulate concentration, and therefore will vary from location to location. This could be due to differences in facilities, ventilation, as well as the number of processes causing dust emissions. Should a respirator be needed, follow OSHA respirator regulations 29 CFR 1910.134 and European Standards EN 141, 143 and 371; wear an MSHA/NIOSH or European Standards EN 141, 143 and 371 approved respirators equipped with particulate filter.

Eye Protection: Safety glasses with side shields per OSHA eye- and face-protection regulations 29 CFR 1910.133 and European Standard EN166. Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Footwear: Wear safety boots.

Clothing: Wear coveralls or other appropriate protective clothing to prevent skin exposure.

Other: Coveralls should be made from fire resistive materials which tend to not accumulate static charges. They should be designed in such a way as to avoid accumulation of dust in cuffs, pockets, etc.

Section 9 Physical and chemical properties

Nickel		
Physical State Solid, powder	Odour and Appearance Odourless, grey.	Odour Threshold (ppm) NA
Specific Gravity 8.90	Vapour Density NA	Vapour Pressure (mmHg) ~ 0
Evaporation Rate NA	Boiling Point (°C) 2,732	Freezing Point (°C) 2,054
PH NA	Coefficient of Water/Oil Distribution ND	Solubility in Water (optional) Insoluble
Aluminum		
Physical State Solid, powder	Odour and Appearance Odourless, light grey in colour.	Odour Threshold (ppm) NA
Specific Gravity 2.70	Vapour Density Greater than air (air=1)	Vapour Pressure (mmHg) 1 at 1284°C
Evaporation Rate ND	Boiling Point (°C) 2467	Freezing Point (°C) 660
PH ND	Coefficient of Water/Oil Distribution ND	Solubility in Water (optional) Insoluble
Zinc		
Physical State Solid powder	Odour and Appearance Odourless, Grey.	Odour Threshold (ppm) NA
Specific Gravity 7.14	Vapour Density NA	Vapour Pressure (mmHg) 1 mmHg at 487 °C.
Evaporation Rate NA	Boiling Point (°C) 908	Melting Point (°C) 419
pH NA	Coefficient of Water/Oil Distribution ND	Solubility in Water (optional) Insoluble
Aluminum Oxide		
Physical State Solid powder	Odour and Appearance Odourless, black or green	Odour Threshold (ppm) Odourless
Specific Gravity 3.97	Vapour Density NA	Vapour Pressure (mmHg) Essentially zero at room temperatur
Evaporation Rate NA	Boiling Point (°C) 2980	Freezing Point (°C) 2054
pH NA	Coefficient of Water/Oil Distribution ND	Solubility in Water (optional) Insoluble

Note: These are typical values and do not constitute a specification.

Section 10 Stability and reactivity

Reactivity: Stable under normal temperatures and pressures. Material does not pose a dust explosion hazard.

Chemical Stability: The product is stable under normal conditions (room temperature).

Conditions to avoid: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Conditions involving moisture (moist air) and any incompatibles.

Incompatible materials: Explosively incompatible with sodium azide. Strong oxidizing materials (ex. Chlorates, bromates, peroxides) when mixed with nickel powder can be explosive when exposed to heat shock, and sometimes light friction. Acids, bases, water, halogens, oxidizing agents (e.g., Dinitrogen tetroxide, bromates, chlorates, sodium peroxide), carbon dioxide, chlorinated hydrocarbons, halogenated hydrocarbons, sulfates, phosphorous, sulfur, some organic matter, nitrates, magnesium, chlorine trifluoride, fluorochloro-lubricants,



nitrate-nitrite, silver chloride, sodium carbonate, antimony, carbon disulfide, arsenic, selenium, metal oxides, oxosalts or sulfides (e.g., Copper or lead oxides, nitrates, sulfates), interhalogens, nitro compounds, non-metal alides (e.g., Phosphorous pentoxide), carbon disulfide, nitrous oxide, phosgene, sulfur dioxide, diborane, alcohols, halocarbons, alkali hydroxides, ammonium nitrate, chromic anhydride, cadmium, hydrazine mononitrate, hydroxylamine, selenium, chlorinated rubber, catalytic metals, nitrobenzene, potassium nitrate, lead azide, ethylene oxide, oxygen difluoride, vinyl acetate.

Hazardous decomposition products: Nickel carbonyl gas. 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. Metal powders when heated in reducing atmospheres may become pyrophoric. Flammable hydrogen gas and zinc oxide.

Section 11 Toxicological information

Irritancy of Product: Product may cause irritation to eyes, nose, and throat, along with some potential for skin irritation. It may cause gastrointestinal irritation if large amounts are consumed.

Skin Sensitization: Potentially **Respiratory Sensitization:** ND

Carcinogenicity:
 This product is not listed as a carcinogen or potential carcinogen by OSHA, AGCIH, IARC or NTP.

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.	Teratogenicity: ND
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Embryotoxicity: ND	Mutagenicity: No Effect
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Name of Toxicologically Synergistic Products/Effects: ND

Symptoms related to the physical, chemical and toxicological characteristics

May cause allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing. Inhalation of high levels of zinc oxide may result in tightness of chest, metallic taste, cough, dizziness, fever, chills, headache, nausea, and dry throat. Overexposure may produce symptoms known as metal fume fever or "zinc shakes"; an acute, self-limiting condition without recognized complications. Symptoms of metal fume fever include: chills, fever, muscular pain, nausea and vomiting. Like any finely divided particulate matter, zinc oxide may cause mechanical irritation to skin and eyes.

Delayed and immediate effects and also chronic effects from short and long term exposure

Skin: Nickel metal is a well-known skin sensitizer. Direct and prolonged skin contact with metallic nickel may induce and elicit allergic skin reactions in those people already sensitized to nickel, so called nickel allergic contact dermatitis.

Eye Contact: Small copper particles in the eyes may cause irritation, discoloration, and damage.

Inhalation: To date, there is no evidence that nickel metal causes cancer in humans based on epidemiology data from workers in the nickel producing and nickel consuming industries. A recent animal (rat) inhalation study showed no increased respiratory cancer risk for nickel metal powder indicating that no carcinogen classification is warranted for nickel metal. The U.S. National Toxicology Program has listed metallic nickel as reasonably anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC)(Vol 49) found 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 (Group 2B). In 1997, the ACGIH categorized elemental nickel as: AS "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. Zinc dust is discomforting to the respiratory tract when inhaled and initially acts as a respiratory irritant. Zinc oxide fumes and vapour produced from high temperature processes can produce 'metal fume fever'. Symptoms include headache, nausea, chills, muscle aches, fever, coughing, chest tightness and a metallic taste in the mouth. The onset of symptoms may be delayed by up to 24 hours after exposure however normally symptoms present between 3 and 10 hours post exposure and can last for



approximately 48 hours. Personnel may be particularly susceptible to metal fume fever after a period of non-exposure

Ingestion: The U.S. National Institute for Occupational Safety and Health (NIOSH) concluded that there is no evidence that nickel metal is carcinogenic when ingested.

Effects of Acute exposure: May cause sensitization by skin contact Nickel and nickel compounds may cause a form of dermatitis known as nickel itch. May cause an allergic skin reaction. Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing.

Effects of Chronic Exposure: Animal studies (rats) show that repeated dose inhalation of nickel damages the lung. Chronic inflammation, lung fibrosis and accumulation of nickel particles were observed. Direct and prolonged skin contact with nickel metal may cause nickel sensitization resulting in nickel allergic contact dermatitis /skin rash. Aluminum dust is considered to be a nuisance particulate by OSHA. Continued exposure to concentrations above the recommended TLV may cause irritation of the eye, mucous membranes and upper respiratory tract. Inhalation of zinc oxide fumes can cause fever, muscle pains, shivering and nausea. In general these troubles last only 24 hours without any after-effect (zinc fever).

Numerical measures of toxicity

Nickel:	LD ₅₀ , mouse, oral >9,000 mg/kg.
Aluminum:	LD ₅₀ , mouse, oral > 2,000 mg/kg Inhalation - rat - 4 h - > 888 mg/l
Zinc:	LD ₅₀ , mouse, oral > 2,000 mg/kg Inhalation - rat - 4 h - > 5.4 mg/l

Section 12 Ecological information

Very toxic to aquatic organisms. For ecological information pertaining to these chemicals, data can be obtained through such organizations as The Ministry of Environment, ESIS: European chemical Substances Information System, as well as the HSDB: Hazardous Substance Data Bank.

Section 13 Disposal considerations

Waste Disposal Methods: Recover or recycle if possible. Dispose of contents in accordance with local, state or national legislation. Do not contaminate ground or surface waters via drainage, by cleaning of equipment or disposal of wastes. Any hazardous wastes should be shipped to a permitted waste disposal facility. Due to the fact that processing/use of the product could potentially alter its characteristics (and consequently its waste management classification), instructions on proper disposal processes should be identified through contact with appropriate environmental regulatory agencies.

Section 14 Transport information

DOT:	UN3077, Environmentally Hazardous Substance, Solid NOS (Nickel Powder), 9, III Marine Pollutant. Applies to nickel powders if they are less than 100 micron in particle size and if they are packaged in quantities greater than 100 pounds
DOT EXCEPTION:	Under 49 CFR 171.4, except when transporting aboard a vessel, the requirements of this subchapter specific to marine pollutants do not apply to non-bulk packaging transported by motor vehicles, rail cars, and aircraft
ADR/RID:	UN3077, Environmentally Hazardous Substances, Solid, NOS (Nickel Powder), 9, III Marine Pollutant.
IMO/IMDG:	UN3077, Environmentally Hazardous Substances, Solid, NOS (Nickel Powder), 9, III Marine Pollutant.
ICAO/IATA:	Not regulated if shipped in non-bulk packaging.

Section 15 Regulatory information

EU regulations



Refer to Directive on Major accident hazard 96/82/EC: 9.a Dangerous for the environment - 50t/200t

Refer to Directive 94/33/EC on the protection of young people at work

Refer to 552/2009/EC amending Regulation 1907/2006/EC: Annex XVII point 27

- IARC:** Neither aluminum, zinc, nor aluminum oxide is listed in Group 1, 2A, 2B, 3 or 4 of the IARC carcinogenic lists.
- NTP:** Neither aluminum, zinc, nor aluminum oxide is listed in the 10th Report on Carcinogens for 'Known Human Carcinogens', nor 'Reasonably Anticipated to be Human Carcinogens' lists.
- OSHA:** Neither aluminum or zinc are listed as carcinogens under OSHA, and aluminum oxide (with less than 1% crystalline silica) as A4 (Not Classifiable as a Human Carcinogen).
- TDG:** Both aluminum and zinc are listed by name in the Transportation of Dangerous Goods Regulations as Class 4.3, and metal powders in general are listed as Class 4 hazards.
- DSL:** All ingredients are listed.
- TSCA :** All ingredients are listed.

Section 16 Other information

Acronyms:

ACGIH	= American Conference of Governmental Industrial Hygienists
CAS	= Chemical Abstract Service
CEHS	= Center for Environmental Health & Safety
CFR	= Code of Federal Regulations
DOT	= Department of Transportation
DSL	= Domestic Substances List
EINECS	= European Inventory of Existing Commercial Substances
IMDG	= International Maritime Dangerous Goods
IARC	= International Agency for Research on Cancer
IDLH	= Immediately Dangerous to Life or Health
LC ₅₀	= Lethal dose (50 percent kill)
LD _{Lo}	= Lowest published lethal dose
NA	= Not applicable
ND	= Not determined
OSHA	= Occupational Safety and Health Administration
PEL	= Permissible exposure limit
TDG	= Transportation of Dangerous Goods
TDUST	= Total dust
TLV	= Threshold limit value
TSAC	= Toxic Substances Control Act (United States)
UN	= United Nations
% WT	= Percent weight

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* End of SDS CWL-F405-AE *