Section 1 Identification

Product Name: **CenterLine® Cold Spray Feedstock Powder – Copper-Aluminum-Aluminum Oxide**
Product Numbers: SST-C0075
Synonyms: Cu-Al-Al_2O_3 Blend, Copper-Al-Alumina 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)

Aquatic Acute 1 Hazard statement: H400 - Very Toxic to aquatic life
Aquatic Chronic 3 Hazard statement: H412 - Harmful to aquatic life with long lasting effects

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

Acute Toxicity, Oral – Category 4
Acute Toxicity, Inhalation – Category 4
Irritant, Eye – Category 2B
Copper Fume: Irritant, Respiratory – Category 3

Label Elements

Regulation (EC) No.1272/2008 (CLP)

Pictogram(s):

Signal word: WARNING

Hazard statement:

H302 - Harmful if swallowed.
H320 - Causes eye irritation.
H335 - May cause respiratory irritation.
H400 - Very toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects.

Precautionary statements:

P273 - Avoid release to the environment.
P312 - Call a Poison Center or doctor/physician if you feel unwell
P391 - Collect spillage.
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

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

Pictogram(s):

Signal Words: WARNING

Hazard Statements: H302 - Harmful if swallowed.
H335 - May cause respiratory irritation.
H320 - Causes eye irritation.
H400 - Very toxic to aquatic life
H412 – Harmful to aquatic life with long lasting effects

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 + P312 + P330 - IF SWALLOWED: Call a poison center if you feel unwell. Rinse mouth with water.
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305 + 351 + P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations.

Section 3 Composition/information on ingredients

Ingredients	CAS Number	EINECS NO.	% WT	OSHA-PEL	ACGIH-TLV
Cu	7440-50-8	231-159-6	75-85	0.1 mg/m^3 (Fume) 1.0 mg/m^3 (Dust)	0.2 mg/m^3 (Fume) 1.0 mg/m^3 (Dust)
Al	7429-90-5	231-072-3	10-15	15 mg/m^3 (Total) 5 mg/m^3 (Resp)	1 mg/m^3
Al_2O_3	1344-28-1	215-691-6	5-10	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.
Means of Extinction: Use gentle surface application of Class D extinguishing media or dry sand to cover and ring the burning material. If possible, isolate the burning material. Allow the fire to burn out. Do not disturb the material until completely cool.
Hazardous Combustion Products: NA
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: Copper powder with particles sizes 50µm size range is classified as weakly explosive by the U.S. Bureau of Mines Report RI-6516. When present as a dust cloud, will NOT explode readily in air. Not easily ignited by sparks. 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.

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
Note: These values may vary with particle size. Refer to NFPA 484 for further data for specific particle sizes.	

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

Copper		
Physical State	**Odour and Appearance**	**Odour Threshold (ppm)**
Solid, powder	Odourless, reddish.	NA

Specific Gravity 8.94	**Vapour Density** ND	**Vapour Pressure (mmHg)** ~ 0
Evaporation Rate ND	**Boiling Point (°C)** 2,567	**Freezing Point (°C)** 1,083
PH ND	**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 mmHg 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
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: The material should be kept away from any sources of ignition, moisture, or incompatible substances.
Chemical Stability: Stable to ignition temperature of 700°C.
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: 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: No hazardous decomposition products.

Section 11 Toxicological information

Irritancy of Product:
Product may cause irritation to eyes, nose, and throat, along with some potential for skin irritation.

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: Copper may decrease fertility in males and females. In a study 16% of 75-100 males that were exposed to 111-434 mg/m^3 copper dust experienced impotence (ATSDR, 2002). But no control group was used so this may have affected the results.	**Mutagenicity:** In-vivo studies with copper salts ha negative results.
Embryotoxicity: ND	**Teratogenicity:** ND

Name of Toxicologically Synergistic Products/Effects: ND

Symptoms related to the physical, chemical and toxicological characteristics
Copper is an essential element of mammalian metabolism. Copper metal has little or no serious toxicity. The most common adverse effect associated with copper is the acute inhalation of copper fume during refining or welding. Inhalation of copper fume or dust may result in metal fume fever, which is characterized by upper respiratory irritation, chills, metallic or sweet taste, nausea, and aching muscles. Attacks usually begin after 4-8 hours of exposure and last only 24-48 hours. Inhalation of fumes has been reported to sometimes cause discoloration of the skin and hair. Nausea and vomiting may result if larger amounts of copper metal are ingested. This is probably due to the conversion of the swallowed metal copper to its irritating salts. It is unlikely that poisoning by ingestion in industry would progress to a serious point because small amounts induce vomiting, emptying the stomach of copper salts. High airborne concentrations of copper metal would be expected to cause mechanical irritation of the eyes and respiratory tract. Metallic copper may cause keratinization of the hands and soles of the feet, but it is not commonly associated with industrial dermatitis. No component of this product present at levels greater than 0.1% is identified as a carcinogen by the U.S. National Toxicology Program, the U.S. Occupational Safety and Health Act, or the International Agency for Research on Cancer (IARC).

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

Skin: Causes irritation to skin. Symptoms include redness, itching, and pain. Exposure to copper dust may cause a greenish-black skin discoloration.

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

Inhalation: Inhalation of dusts and fumes of metallic copper cause irritation of the upper respiratory tract, congestion of nasal mucous membranes, ulceration and perforation of the nasal septum, and pharyngeal congestion. Inhalation of copper fumes may give rise to metal fume fever (high temperature, metallic taste, nausea, coughing, general weakness, muscle aches, and exhaustion).

Ingestion: Copper ingestion causes nausea, vomiting, abdominal pain, metallic taste, and diarrhea. Ingestion of large doses may cause stomach and intestine ulceration, jaundice, and kidney and liver damage.

Effects of Acute exposure: Irritation to eyes, throat, and nose. There is potential to develop 'metal fume fever' if exposed to copper. Characterized by fever, chills, chest tightness, and coughing.

Effects of Chronic Exposure: Prolonged or repeated exposure to copper can discolor skin and hair and irritate the skin; may cause mild dermatitis, runny nose, and irritation of the mucous membranes. Repeated ingestion may damage the liver and kidneys. Repeated inhalation can cause chronic respiratory disease. 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.

Numerical measures of toxicity

Copper:	LD_{50}, mouse, oral >5,000 mg/kg.	
Aluminum:	LD_{50}, mouse, oral > 2,000 mg/kg	Inhalation - rat - 4 h - > 888 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: Copper can be extracted from wastes by way of ion exchange, reverse osmosis, or evaporation, and then by using electrolysis, the copper can be collected. 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: RQ, Environmentally Hazardous Substance, Solid NOS (contains Copper), 9, UN3077, III Marine Pollutant.

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 (contains Copper), 9, III Marine Pollutant.
IMO/IMDG: UN3077, Environmentally Hazardous Substances, Solid, NOS (contains Copper), 9, III Marine Pollutant.
ICAO/IATA: Not regulated if shipped in non-bulk packaging.
REPORTABLE QUANTITY: Copper 5,000 lbs.

Section 15 Regulatory information

CEHS: Aluminum oxide is listed under the CEHS's Non-hazardous waste disposal list.
CFR: Respiratory protection information was obtained from 29 CFR 1910.134 or 42 CFR 84.
DSL: All ingredients are listed.
TSCA: All ingredients are listed.
IARC: Copper, aluminum and aluminum oxide appeared in any studies, listed in the IARC Monographs Program on the evaluation of Carcinogenic Risks to Humans that reported carcinogenic results.
NTP: Copper, aluminum and aluminum oxide are listed in the 10th Report on Carcinogens for 'Known Human Carcinogens', or 'Reasonably Anticipated to be Human Carcinogens' lists.
OSHA: Did not list copper as a carcinogen, and lists aluminum oxide (with less than 1% crystalline silica) as A4 (Not Classifiable as a Human Carcinogen).
TDG: Metal powders that are flammable or spontaneously combustible are listed in the Transportation of Dangerous Goods Act under Transportation of Dangerous Goods Regulations, schedule 1 as a class 4 hazard. Copper, aluminum and aluminum oxide are flammable or spontaneously combustible, and are not listed under this Regulation.

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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