



## SAFETY DATA SHEET

### 1. PRODUCT AND COMPANY IDENTIFICATION

**Product Identifier:** NANOFOIL®

**SDS Number:** SDS-5095

**Revised Date:** 15 FEBRUARY 2018

**Product Use:** INDUSTRIAL USE – MIXTURE OF ALUMINUM AND NICKEL ENCAPSULATED IN InCuSiI Cladding NF-30,40,50,60,80,100,125,150 and 200 micron Series. This is a multilayer foil material also known as a pyrotechnic initiator of two reactive metals. Nanofoil® is used in applications such as soldering as a source of heat. The components can be joined when the foil is between layers to be joined. When initiated the heat energy across the area will join the pieces. Contact Indium Corporation or go to <http://www.indium.com> on guidance and proper use of the material.



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**2. HAZARDS IDENTIFICATION****PRIMARY ROUTES OF ENTRY:**

⊕Eye    ⊕Inhalation    ⊕Skin    ⊕Ingestion

**CARCINOGEN LISTED IN:**

NTP    IARC    OSHA    ⊕Not Listed



Signal Word: Danger

**Hazard statement(s):**

H228      Flammable Solid  
 H313      May be harmful in contact with skin  
 H317      May cause an allergic skin reaction  
 H351      Suspected of causing cancer (nickel)

**Precautionary statement(s)**

P210      Keep away from heat/sparks/open flames/hot surfaces. – No smoking  
 P233      Keep container tightly closed  
 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  
 P280      Wear protective gloves/protective clothing/eye protection/face protection  
 P362      Take off contaminated clothing and wash before reuse  
 P301+ P310      IF SWALLOWED: Immediately call a POISON CENTER/doctor/physician  
 P302 +P352      IF ON SKIN: Wash with plenty of soap and water  
 P304 + P341      IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing  
 P305 + P351      IF IN EYES: Rinse continuously with water for several minutes (15 mins)  
 P405      Store locked up

**Classification:**

Flammable solids- category 2  
 Acute toxicity, dermal-category 5  
 Sensitization, skin-category 1B  
 Carcinogenicity-category 2 (nickel)

At this time full GHS review is still on-going regarding proper classification for this product

**IMPORTANT EMERGENCY OVERVIEW:** In the un-reacted, metallic foil or sheet form, layered aluminum and nickel are highly reactive and ignition will result in generation of heat. Once ignited, reaction of the entire sheet/foil is for all practical purposes instantaneous and impossible to extinguish. In solid form, the product is not considered hazardous to health other than the potential for burns should ignition occur while actually handling.

**Avoid inhalation of fumes.****POTENTIAL HEALTH EFFECTS:**

**WARNING - HANDLE WITH CARE.** Metallic sheets vary in sizes and thickness. An exothermic reaction in the material may be initiated for example by electric spark, electric current, direct contact with flame, sudden or rapid increase in temperature, high intensity laser beam, concentrated microwave energy, intense mechanical impact, or abrasion such as friction. Other activities such as dropping of the sheet onto a floor, banging sheet against an object, dropping something onto a sheet or just knocking a corner could set the reaction off.

The foil or metallic sheet glows yellow when reacting and can reach temperatures of 1500C (2732F) instantly upon ignition.

**Eye Contact:** Reaction fumes may cause irritation.

**Ingestion:** Not expected to be a route of entry. Ingestion of fumes may cause irritation

**Inhalation:** Inhalation of reaction fumes may cause irritation. Nickel fume may cause allergic asthma. Inhalation of fumes from initiation of the exothermic reaction in the material or generation of dust by grinding or abrasion may aggravate allergy symptoms in sensitized individuals or trigger an attack in asthmatic individuals.

**Skin Contact:** Normal handling should not cause any adverse health effects. However, contact or close proximity during reaction may cause thermal burns. Nickel may cause skin sensitivity or dermatitis.

**Chronic:**

**SILVER:** Chronic skin contact or ingestion of silver dusts, salts or fume can result in a condition known as Argyria, a condition with bluish pigmentation of the skin and eyes.

**COPPER:** Overexposure to fumes may cause metal fume fever (chills, muscle aches, nausea, fever; dry throat, cough, weakness, lassitude); metallic or sweet taste; discoloration of skin and hair.

**INDIUM:** May cause damage to respiratory system.

**NICKEL:** May cause a form of dermatitis known as nickel itch. Intestinal irritation, which may cause disorders, convulsions and asphyxia.

**ALUMINUM:** inhalation of finely divided aluminum powder may cause pulmonary fibrosis.

**WARNING:** **Applicable in the State of California under the Safe Drinking Water Standard, Prop 65. This product contains a chemical known to the State of California to cause cancer and/or birth defects (or other reproductive harm). (trace levels of lead), nickel**

**NOTE:** **The Indium Corporation does not recommend, manufacturer, market or endorse any of its products for human consumption.**

**3. COMPOSITION / INFORMATION ON INGREDIENTS**

Components	% wt	CAS Registry #/EINECS#	PEL mg/m <sup>3</sup>	TLV-TWA mg/m <sup>3</sup>	TLV-STEL mg/m <sup>3</sup>
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<b>NICKEL</b>	55 – 65	7440-02-0	(US)	1	0.015	-
			(Canada)	-	1	2
			(Singapore)	1	-	-
			(Mexico)	1	-	-
<b>ALUMINUM</b>	25 - 35	7429-90-5	(US)	15	10	-
			(EU)	-	10*	-
			(Canada)	-	10	20
			(Mexico)	-	5	-
<b>VANADIUM</b>	1 – 5	7440-62-2/231-171-1	N.E.	N.E.	N.E.	
<b>INDIUM</b>	<2	7440-74-6/231-180-0	(US)	0.1	0.1	-
			(EU)	-	0.1	0.3
			(Canada)	-	0.1	0.3
			(Singapore)	0.1	-	-
			(Mexico)	-	0.1	0.3
			(China)	-	0.1	0.3
<b>SILVER</b>	1 - 10	7440-22-4/231-131-3	(US)	0.01	0.1	-
			(EU)	-	0.1	-
			(Canada)	-	0.1	0.3
			(Singapore)	0.1	-	-
			(Mexico)	-	0.1	-
<b>COPPER</b>	1 - 5	7440-50-8/231-159-6	(US)	0.1	0.2	-
			(EU)	-	0.2(fume)	-
			(Canada)	-	0.2	0.6
			(Singapore)	0.2	-	-
			(Mexico)	-	0.2	2

(China)

-

0.2(fume)

0.6

Immediately Dangerous To Life and Health (IDLH) – Nickel 10 mg/m<sup>3</sup>  
Reacted material is Nickel Aluminide CAS# 12003-78-0 (EINECS 231-111-4)

N.E. = Not established      EU = European Union Occupational Exposure Limits

#### 4. FIRST AID MEASURES

**Eye Contact:** Hold eyelids apart and flush eyes with plenty of tepid water for at least 15 minutes. Seek medical attention if irritation persists. Flash may cause burns to the eyes, seek medical advice.

**Ingestion:** Not likely a route of entry. If patient is conscious, ONLY induce vomiting as directed by trained personnel. NEVER give anything by mouth to an unconscious person. Seek medical attention immediately.

**Inhalation:** Remove to fresh air. If not breathing, give artificial respiration or oxygen by trained personnel. Seek immediate medical attention. Generally not considered to be a route of entry.

**Skin Contact:** Contact may cause thermal burns. Remove any contaminated clothing. Wash affected area with soap and water. Wash clothing before reuse. If burned seek medical attention.

#### 5. FIRE FIGHTING MEASURES

**Flash Point:** Not established.      **Method:** Not established.

**Auto-ignition Temperature:** Reaction Temp: 1500C (2732F) instantaneously

**Flammable Limits:** Limits not established.

**Extinguishing Media:** Use extinguishers appropriate for the surrounding fire conditions. Once ignited the reaction is instantaneous and complete.

**Special Fire Fighting Procedures:** Firefighters must wear NIOSH approved self-contained breathing apparatus and full protective clothing.

**Note:** Unusual fire hazards: Material is a self - heating and self - reacting product. Once it is ignited it will react immediately. Material is not explosive and will extinguish itself provided it is away from combustible materials. Material is not explosive. Fire could occur with secondary sources having direct contact with the initial reaction of the Nanofoil.

#### 6. ACCIDENTAL RELEASE MEASURES

##### Spill or Leak Procedures:

**Un-reacted material** is sensitive to ignition sources. Keep away from sources of heat or spark. If dust or powder do not dry sweep material. Wet materials prior, for clean-up. Do not use compressed air or vacuum for clean-up. Place inside metal container, cover and label. Material is considered to be a flammable solid. Keep unauthorized personnel away.

Non spark tools.

**Re-acted material** clean up by using wet sweeping and avoid dust generation. Place into metal container, cover and label. Caution handle with care to ensure all material has reacted completely. If in doubt handle only as a flammable solid.

Dispose of following all Federal, State and Local regulations. In the EU refer to the Special Waste Regulations.

## 7. HANDLING AND STORAGE

**Handling Precautions:** Handle away from sources of ignition. Avoid static charges. Wear leather gloves when handling. Handle with care. Keep all combustible materials away from product. Product can flash and while it does burn quickly the hazard could be any secondary fire.

**WARNING - HANDLE WITH CARE.** Metallic sheets vary in sizes and thickness. An exothermic reaction in the material may be initiated for example by electric spark, electric current, direct contact with flame, sudden or rapid increase in temperature, high intensity laser beam, concentrated microwave energy, intense mechanical impact, or abrasion such as friction. Other activities such as dropping of the sheet onto a floor, banging sheet against an object, dropping something onto a sheet or just knocking a corner could set off the reaction.

The foil or metallic sheet glows yellow when reacting and can reach temperatures of 1500C (2732F) instantly upon ignition.

**Storage Precautions:** Store in electrically grounded, antistatic, closed containers. Keep away from sources of heat, open flames, sparks, combustibles and sources of static charge. Store in cool dry environment. Safe storage in flammable cabinet is required. Handle material with care. Keep away from material that could be a secondary source of fire should the Nanofoil ® react. Keep away from busy work areas where there might be a potential for the material to be disturbed.

For additional information please go to <http://www.indium.com> and look up Nanofoil for additional use/handling information.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Engineering Controls:** Local exhaust ventilation is required to control any metal containing air contaminants. Control concentration of all components so that their exposure levels are not exceeded. Metal fume must be properly vented. Employees should avoid potential exposure. Use shields when reacting the metal to avoid splash hazards from ignition. Keep hands away.

### Personal protection:

**Eyes:** Chemical safety glasses/goggles and face shield with reactive metal.

**Respirator:** An authority approved or compliant marked air-purifying respirator with a fume/dust chemical cartridge is recommended under certain circumstances where airborne concentrations are expected to be elevated. Protect against exposures to fume and dust. Avoid breathing fumes.

**Skin:** Gloves-leather type. Heat resistant gloves if handling hot metal. Avoid direct skin contact.

**Other:** Lab coat, safety shower and eye-wash fountain in work area. Avoid the use of contact lenses in high fume/splash areas.

**Work/Hygienic Practices:** Maintain good housekeeping. Clean up spills immediately. Good personal hygiene is essential. Avoid eating, smoking or drinking in the work area. Wash hands thoroughly with soap and water immediately upon leaving the work area.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Appearance:</b>	Silver grey solid metal	<b>Boiling Point:</b>	Not applicable.
<b>Odor:</b>	Odorless	<b>Melting Point:</b>	See Below
<b>Specific Gravity:</b>	Not available	<b>pH:</b>	Not applicable
<b>Vapor Pressure:</b>	Not applicable.	<b>Solubility in Water:</b>	Insoluble

**Vapor Density:** (air=1) Not applicable.

**Melting Points:** Al = 660C, Ni = 1455C, InCuSil-15 =705C

Note: Material can flash quickly. Fire will occur quickly and burn out. It will not sustain. Watch for secondary fires.

## 10. STABILITY AND REACTIVITY

**General:** Stable at room temperature and pressure. Product is self-heating and self- reacting upon initiation. Handle with care. Review Sections 2 and 7.

**Conditions to Avoid:** Sudden temperature increase, high oxygen content atmosphere and initiation sources. Known initiation sources are flame, laser, concentrated microwaves, static discharges and electric or mechanical sparking.

**Incompatible Materials:** Avoid contact with halogens, strong acids, strong alkalis, oxidizing agents, flammables and combustibles. Reacts with hydrochloric acid, performic acid and ammonium nitrate.

**Hazardous Decomposition / Combustion** Harmful organic fumes, metal oxide and toxic oxide fumes may form at elevated temperatures.

**Hazardous Polymerization:** Will not occur.

## 11. TOXICOLOGICAL INFORMATION

**Carcinogenicity: National Toxicity Program (NTP):** Yes (nickel)

**Occupational Safety & Health Administration (OSHA):** Yes (nickel)

**U.N. International Agency for Research on Cancer (IARC):** Yes (nickel)

RTECS QR5950000, for additional information (nickel)

RTECS GL 5325000, for additional information (copper)

RTECS NL 1050000 for additional information (indium)

RTECS BD0330000 for additional information (aluminum)

RTECS VW3500000 for additional information (silver)

## 12. ECOLOGICAL INFORMATION

No information available at this time.

## 13. DISPOSAL CONSIDERATION

**Waste Disposal Method:** Dispose of in accordance with all Federal, State and Local environmental regulations. In Europe follow the Special Waste Regulations. Material should be properly managed. Un-reacted material is a flammable solid. When disposing ensure material is properly handled. Always handle as if not all material was flashed off. Hazardous material. Keep away from combustibles. If in pieces package in metal drums and layer with sand to protect from friction between pieces and possible ignition. Consult waste disposer for guidance.

## 14. TRANSPORT INFORMATION

Transport in accordance with applicable regulations and requirements.

UN 3178, Flammable Solid, Inorganic, N.O.S., 4.1, PG II (nickel aluminum foil)

North America Emergency Guide Book – Guide #133

Flammable Solid



Passenger aircraft: 15 kg

Cargo aircraft: 50 kg

Packaging must be in an approved over-pack containers.

Contact Indium Corporation for proper packaging or re-packaging instructions of product. Failure to follow proper procedures could result in a hazardous situation.

## 15. REGULATORY INFORMATION

The information in this Safety Data Sheet meets the requirements of the United States Occupational Safety and Health Act and regulations promulgated hereunder (29 CFR 1910.1200 ET. SEQ.).

State of California Safe Drinking Water Standard - PROP 65: WARNING : This product contains a chemical known to the State of California to cause cancer and/or birth defects (or other reproductive harm). (trace levels of lead), nickel

US EPA - SARA 313 Listing - 40 CFR 372.65: Nickel, Silver, Copper

All ingredients are listed on the US EPA TSCA Inventory.

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulation (CPR).

Canadian WHMIS: flammable solid



This product has been classified in accordance with the guidelines set by the Dept. of Industrial Health of the Republic of Singapore.

Regulatory Information China:

GB/T 16483-2008, GB/T 17519-2013, Safety Data Sheets for Chemical Products

GB 30000.2-29-2013, Rules for classification and labeling of chemicals (GHS)

Decree No. 591: Regulations on the Control Over Safety of Hazardous Chemicals.

This product has been classified using the Chinese Occupational Exposure Limit for Hazardous Agents in the Workplace, GBZ2-2007.

Malaysia:

This product has been classified in accordance with: Malaysian – OCCUPATIONAL SAFETY AND HEALTH (CLASSIFICATION, LABELING AND SAFETY DATA SHEET OF HAZARDOUS CHEMICALS) REGULATION OCTOBER 2013 – (CLASS).

This product has been classified in accordance with the Mexican regulations NOM-018-STPS-2015 and



Tariff Code: 7506.20.5000

## 16. OTHER INFORMATION

<b>HMIS Hazard Rating:</b>	<b>Health:</b>	3
	<b>Fire:</b>	1
	<b>Physical Hazard:</b>	2

**Revised Date:** 15 FEBRUARY 2018

**Prepared by:** Nancy Swarts, Indium Corporation of America

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