SAFETY DATA SHEET

Section 1 – Products and Suppliers

SDS: TiH Pastes-FL2-101B (08-2024)

Product Identifier:	Brazing Alloy Pastes with titanium hydride and flammable organic binders
Other means of identification:	Wesgo Metals® Products: See Table 1 in Section 16 for specific products and their respective metal constituents.
Use (and restrictions):	Metal alloys for joining or repairing metal components by brazing/soldering.

Suppliers and emergency contact information:

Morgan Advanced Materials/Wesgo Metals®
2425 Whipple Road
Hayward, California 94544 USA
+1-510-491-1100
0800-1700hrs local time, Mon-Fri.
mtchayward.msds@morganplc.com

SDS Date: 21 Aug 2024. Replaces previous version dated 19 June /2024.

Section 2 – Hazard Identification

These products are sold in a paste-like form in small containers and syringes. These products contain flammable solvents and should be stored in sealed containers when not in use and kept away from ignition sources and hot surfaces. Flammable solvent vapors, metal fumes and dust are generated during melting and brazing operations. Hazardous levels of dust or metal fumes of product constituents can create health risks, as described below. Metallic dust and particles can cause a serious fire and/or explosion hazard.

2.1 Classification

Under the Globally Harmonized System of Classification and Labeling and the US OSHA Hazard Communication Standard, dust and fumes released during brazing operations are categorized as hazardous: (incl. Classification according to Regulation (EC) No 1272/2008 [CLP])

Highly flammable liquid, Category 2	H225	Flashpoint < 23°C/73.4°F and initial boiling point > 35°C/90°F
Eye irritant, Category 2B	H319	Due to the presence of ethanol and/or isopropyl alcohol and indium (in AgCuIn+0.6%TiH-EP, Incusil+3TiH-EP, and Incusil-ABA)

2.2 Signal word, symbols, hazard and precautionary statements:

Danger

Hazard Statements:

H225	Highly flammable liquid and vapor.
H319	Causes eye irritation.

Precautionary Statements:

P210	Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
P280A + P264	Wear protective gloves to prevent skin contact or thermal burns during brazing operations. Wash hands thoroughly after handling.
P280B	Wear ANSI-approved eye protection to prevent eye contact.
P305 + P351 + P338 + P337 + P313	**If in eyes:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **If eye irritation persists:** Get medical attention.
P308 + P309 + P313	**If exposed, concerned, or feel unwell:** Get medical advice/attention.

Note: Accompanying alpha-numeric designations included to address EU regulations.

Other information about health hazards:

Dust and fumes generated during brazing operations can cause skin and eye irritation. Repeated or prolonged exposure to elevated concentrations of any airborne dust or fume can irritate or harm the respiratory system, especially as an aggravation to a pre-existing condition. Inhalation of significant quantities of very fine metal dust and metal fumes can cause “metal fume fever,” with flu-like symptoms. Avoid creating and breathing airborne dust and fumes.

Other information about physical hazards:

Brazing and soldering operations present a fire hazard to nearby combustible materials. Finely dispersed metal particles can form ignitable and explosive mixtures in air. Maintain good housekeeping.

SAFETY DATA SHEET

Section 3 – Composition/Information on Ingredients

3.1 Mixtures:

See Table 1 in Section 16 for specific products and their respective metal constituents.

Constituents	CAS Registry No.	EINECS No.	Constituents[1]	CAS Registry No.	EINECS No.
Aluminum (Al)	7429-90-5	231-072-3	Isopropyl alcohol	67-63-0	200-661-7
Copper (Cu)	7440-50-8	231-159-6	Silicon (Si)	7440-21-3	231-130-8
Ethanol	64-17-5	200-578-6	Silver (Ag)	7440-22-4	231-131-3
Glycerol	56-81-5	200-289-5	Tin (Sn)	7440-31-5	231-141-8
Indium (In)	7440-74-6	231-180-0	Titanium Hydride	7704-98-5	231-726-8

Binder	Binder Ingredients			
	Ethanol	Glycerol	Isopropyl Alcohol	Propylene Glycol
FC-10	X	X		
FC-11			X	X
FC-12			X	X
FC-16		X	X	X
FC-92A			X	X

Section 4 – First Aid Measures

4.1 Description of first aid measures

Inhalation: Remove affected personnel to an exposure-free environment. If experiencing respiratory symptoms: Call a poison center or doctor if you feel unwell.

Skin contact: Wash hands with soap and water. If skin irritation or rash occurs: Get medical advice/attention.

Eye contact Flush eyes with plenty of water. Remove contact lenses, if present and easy to do. Continue rinsing. If necessary, call a specialist.

Ingestion: Not applicable.

Indication of need for immediate medical attention and special treatment: Skin contact with hot metals or flames during brazing operations can cause thermal burns. Seek medical attention for severe thermal burns.

4.2 Most important symptoms and effects, both acute and delayed

No further relevant information available.

www.morganadvancedmaterials.com

Morgan Advanced Ceramics, Inc. 2425 Whipple Rd., Hayward, CA 94544 USA

4.3 Indication of any immediate medical attention and special treatment needed

No further relevant information available.

Section 5 – Fire Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media:

Use dry chemical or carbon dioxide.

Unsuitable extinguishing media:

Do not use water on a metal fire.

5.2 Special hazards arising from the substance or mixture

Combustion hazards:

Products contain flammable solvents. Containers should be kept sealed when not in use. Keep away from heat/sparks/open flames/hot surfaces during storage and use. Flames from brazing operations can ignite combustibles. In a finely divided form, this product may ignite when exposed to flames or by reaction with incompatible materials. Metal oxides or fumes of constituent metals may be emitted during a fire.

5.3 Advice for firefighters

Special fire-fighting procedures:

Use protective clothing and breathing equipment appropriate to the surrounding fire.

Unusual fire and explosion hazards:

Metal powder mixtures can cause fires and/or explosions when present in air at high concentrations.

Section 6 – Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

No special measures required.

6.2 Environmental precautions:

No special measures required.

6.3 Methods and material for containment and cleaning up:

Metal scrap should be collected and contained using normal procedures. Metal particulates, shavings, powders and granules should be cleaned up using wet-sweeping methods to avoid creating dust. Vacuum only with HEPA filtered equipment. **Do not** use compressed air for clean-up. Some fine metal powders may ignite or explode under specific conditions; avoid creating high airborne dust concentrations and accumulating dust. Appropriate personal protective equipment should be used when cleaning up dust. Recovered material should be placed in sealed containers and recycled for their metal content. Dispose in accordance with applicable waste disposal regulations.

6.4 Reference to other sections
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

Section 7 – Handling and Storage

7.1 Precautions for safe handling
Avoid skin contact; wash hands after handling chemicals. Do not eat, drink or smoke while handling these products. All employees who handle this material should be trained to handle it safely. Maintain good housekeeping practices, such as wet sweeping or vacuuming to remove dust accumulation. Avoid dust inhalation or ingestion and contact of materials with eyes. Certain metal powder mixtures can cause fires and/or explosions when present in air at high concentrations.

7.2 Conditions for safe storage, including any incompatibilities
Store in closed containers in a cool, dry, well-ventilated, fire-resistant area away from oxidizing agents and sources of heat and ignition.

7.3 Specific end use(s)
No further relevant information available.

Section 8 – Exposure Controls and Personal Protection

8.1 Control parameters
Exposure limits and guidelines:

Constituents	OSHA PEL 8-Hr TWA	ACGIH TLV 8-Hr TWA
Aluminum (Al)	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)	1 mg/m³ (inhalable fraction)
Copper (Cu)	1 mg/m³ (dust); 0.1 mg/m³ (fume)	1 mg/m³ (dust); 0.2 mg/m³ (fume)
Ethanol	1000 PPM	1000 PPM
Glycerol	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)	10 mg/m³
Indium (In)	None established	0.1 mg/m³
Isopropyl alcohol	400 PPM	200 PPM; 400 PPM (STEL)[Note 1]
Propylene glycol	None established	None established
Silicon (Si)	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)	Withdrawn due to insufficient data
Silver (Ag)	0.01 mg/m³	0.1 mg/m³
Tin (Sn)	2 mg/m³	2 mg/m³
Titanium hydride	None established	None established

Other jurisdictions may have different exposure limits and control guidelines. Users are advised to consult and comply with local regulations.
[1]STEL (Short Term Exposure Limit) - A 15-minute TWA exposure that should not be exceeded at any time during the workday, even if the 8-hour TWA is within the TLV-TWA, PEL-TWA, or REL-TWA.

8.2 Exposure controls

Engineering controls:

Use local exhaust ventilation during brazing operations to minimize or eliminate concentrations of airborne contaminants.

Personal protective equipment:

Wear ANSI-approved eye protection to prevent eye contact. Wear protective gloves to prevent skin contact or thermal burns during brazing operations. Use NIOSH-approved respiratory protective equipment if exposures exceed established limits or guidelines.

General hygiene considerations:

Do not eat, drink or smoke when handling these products. Wash hands after handling these products.

Limitation and supervision of exposure into the environment

The legal issue values and limitations are to be paid attention!

Section 9 – Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance:	Colors vary according to metals	**Odor:**	Slight alcohol odor
Odor threshold:	Not applicable	**pH:**	Not applicable
Melting point:	Not applicable	**Boiling point:**	Not applicable
Flash point:	See table below	**Evaporation rate:**	Not applicable
Flammability:	Not applicable	**LEL/UEL:**	Not applicable
Vapor pressure:	Not applicable	**Vapor density:**	Not applicable
Relative density:	Not applicable	**Water solubility:**	Not applicable
Partition coefficient (n-octanol/water):	Not applicable	**Auto ignition temperature:**	Not applicable
Decomposition temperature:	Not applicable	**Viscosity:**	Not applicable

Flashpoint data for paste binders (See Table 1 in Section 16 for specific products and applicable gel binders):

Gel Binders		
FC-10	**FC-11/12/92A**	**FC-16**
70°F / 21°C	59°F / 15°C	63°F / 17°C

www.morganadvancedmaterials.com

Morgan Advanced Ceramics, Inc. 2425 Whipple Rd., Hayward, CA 94544 USA

9.2 Other information
No further relevant information available.

Section 10 – Stability and Reactivity

10.1 Reactivity
No additional information available.

10.2 Chemical stability
Braze alloy products are stable when stored in closed containers at room temperature under normal storage and handling conditions.

10.3 Possibility of hazardous reactions
Heating to elevated temperatures may liberate metal/metal oxide fumes (i.e., during brazing operations). Metal powder mixtures can cause fires and explosions (if present at high airborne concentrations).

10.4 Conditions to avoid:
Avoid open flames around fine metal powders.

10.5 Incompatible materials:
Metals in particulate form are typically incompatible with strong acids and strong oxidizing agents.

10.6 Hazardous decomposition products:
No dangerous decomposition products known.

Section 11 – Toxicological Information

11.1 Information on toxicological effects
User-generated dusts and fumes may, on contact with the skin or eyes, produce mechanical irritation. Chronic exposures could cause dermatitis (skin) or conjunctivitis (eyes). Excessive inhalation of powders or user-generated fumes from welding/ brazing with these products may, depending on the specific features of the process used, pose a long-term health hazard. The composition of fumes and gases generated in user operations will depend on the metal alloy, base metal and the specific process being used and may include metals, metal oxides, carbon monoxide, ozone, and oxides of nitrogen.

Additional toxicological information is available through the U.S. National Institute for Occupational Safety and Health (NIOSH) and the Registry of Toxic Effects of Chemical Substances (RTECS).
See website: http://www.cdc.gov/niosh/ipcsneng/nengrtec.html. Applicable product constituents and their respective RTECS numbers are listed below:

Aluminum	BD0330000	Indium	NL1050000	Silver	VW3500000
Copper	GL5325000	Isopropyl alcohol	NT8050000	Tin	XP7320000
Ethanol	KQ6300000	Propylene glycol	TY2000000	Titanium hydride	XR2130000

Section 12 – Ecological Information

12.1 Toxicity

When used in their intended manner, these products would not be expected to be released to the environment. Adverse effects on ecosystems are not anticipated under normal and recommended conditions of handling, use, storage and disposal. None of the constituents in these products are classified as environmentally persistent, bio-accumulative toxic chemicals. Copper is a marine pollutant. Silver is an environmental pollutant.

Section 13 – Disposal Considerations

13.1 Waste treatment methods

Manage waste materials in accordance with applicable waste and disposal regulations. Whenever possible, try to recycle and reclaim due to the intrinsic value of certain braze alloy constituents. Whatever cannot be saved for recovery or recycling should be shipped to a permitted waste management facility. Certain products may contain silver, which could cause them to be a hazardous waste as defined by US EPA RCRA regulations, if disposed instead of recycled. Process, use or contamination of this product may change the characteristics of the waste and, consequently, how the waste is managed.

Section 14 – Transport Information

Braze alloy paste products contain gel binders that consist of ethanol or isopropyl alcohol and are regulated by the U.S. Department of Transportation.

Product Binder	UN Number	UN Proper Shipping Name	Hazard Class	Packing Group
FC-10	3175	Solids containing flammable liquids, n.o.s. (contains ethanol)	4.1	II
FC-11, 12, 16 & 92A	3175	Solids containing flammable liquids, n.o.s. (contains isopropyl alcohol)	4.1	II

Special precautions for user

See Section 6 – 8.

SAFETY DATA SHEET

Section 15 – Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

- Copper and silver in dust form are hazardous substances as defined by the U.S. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).
- All brazing product components are listed on the U.S. Toxic Substances Control Act (TSCA) inventory.
- Certain braze alloy products contain copper and silver, which are subject to the reporting requirements of Section 313 of the U.S. Emergency Planning and Community Right-to-Know Act (SARA Title III). Please refer to Table 1 in Section 16 for applicable products.

Section 16 – Other Information

Summary of Latest Revision: 18 Oct 2021: Updated DOT information in Section 14.
17 Nov 2022: Correction in composition for Cusil-2Ti.
08 Aug 2023: Added new product to Table 1: Incusil-15-ABA
19 June 2024: Corrected Hazard Class in Section 14 (changed from 3 to 4.1).
21 Aug 2024: Corrected composition percentages for Incusil 25-ABA (Binder FC-11) and Incusil 25-ABA (Binder FC-92A).

Paste Products	Binder Type	Binder %	TABLE 1 COMPOSITION - % WEIGHT						
			Al	Ag	Cu	In	Si	Sn	TiH
AgCuIn+0.6%TiH-EP	FC-11	10		53	24	12			1
Copper-ABA	FC-11	10	2		83		3		2
Copper-ABA+13Ti	FC-11	10	1		62		2		10
Cusil-ABA	FC-11	10		56	32				2
Cusil-ABA	FC-92A	10		56	32				2
Cusil-2Ti	FC-11	10		63	25				2
Cusin-1-ABA	FC-11	10		57	30			1	2
Incusil+3TiH-EP	FC-11	10		52	24	11			3
Incusil-ABA	FC-16	10		52	24	12			2
Incusil-ABA	FC-11	10		52	24	12			2
Incusil-15-ABA	FC-11	10		54	21	13			2
Incusil-25-ABA	FC-11	10		40	25	22			3
Incusil-25-ABA	FC-92A	10		40	25	22			3
Silver-ABA	FC-11	10	1	84	4				1
Ticusil	FC-16	10		62	24				4

www.morganadvancedmaterials.com
Morgan Advanced Ceramics, Inc. 2425 Whipple Rd., Hayward, CA 94544 USA

SAFETY DATA SHEET

Reasonable care has been taken in the preparation of information contained in this Safety Data Sheet and the information is provided in good faith. Information provided in this Safety Data Sheet has been prepared by competent and appropriately qualified and trained persons according to the US OSHA Hazard Communication Standard. Morgan Advanced Materials - Wesgo Metals® assumes no responsibility as to the accuracy of information drawn from other sources. No warranty, expressed or implied, is made.

Abbreviations and acronyms

ANSI	American National Standards Institute
ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstracts Service (division of the American Chemical Society)
EINECS	European Inventory of Existing Commercial Chemical Substances
HEPA	High-efficiency particulate air filters
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	Permissible exposure limit
RCRA	Resource Conservation and Recovery Act
TLV	Threshold Limit Values
TWA	Time-weighted Average

www.morganadvancedmaterials.com
Morgan Advanced Ceramics, Inc. 2425 Whipple Rd., Hayward, CA 94544 USA