

Compiled: 3/9/2015, Rev. 2, 14/01/2018, Rev. 3. 20/12/2019, Rev. 4, 20/02/2020 Rev. 5, 10/02/2021, Rev.6, 17/10/2023 Rev.7, 20/10/2023, Rev.8.14/02/2024, Rev9.27/03/2024

*This safety data sheet is compliant with the requirements of Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (OJ L 396, 30.12.2006, pp. 1–849).*

### 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

#### 1.1. Product identifiers

Product name: X-ray Flux, Fusion flux, Fusion bonding agent, Flux, Glass powder (lithium), Lithium tetra/meta borate. Lithium Tetraborate, Lithium Metaborate, (Types: LT-100, LM-100, 20:80, 12:22, 57:43, 66:34, 80:20, 50:50), or any of the previous combinations of Lithium Tetraborate and / or Lithium Metaborate with or without one or more minor additions of Lithium Bromide, Lithium Iodide, Potassium Iodide, Sodium Iodide, Ammonium Iodide, Tantalum oxide, Thulium oxide, Sodium Carbonate, Sodium Nitrate or Lithium Nitrate as per the addition rates in (3) below.

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

Analysis of ores, minerals and other substances by x-ray spectroscopy.  
Not subject to export restriction from Australia.

#### 1.3. Identified uses: Laboratory chemicals, Industrial & for professional use only.

##### Details of the supplier of the safety data sheet

Company: XRF Chemicals Pty Ltd, 88 Guthrie St, Osborne Park, 6017, Perth, Australia  
Telephone: +61 (0)8 9244 9600  
Email: xrf.chemicals@xrfscientific.com

#### 1.4. Emergency telephone number

Emergency Phone #: +61 (0)8 9244 9600 (9:00am - 6:00 pm) [Office hours]

### 2. HAZARDS IDENTIFICATION

#### 2.1. Classification of the substance or mixture

Carried out in accordance with CLP Regulation (EC) No 1272/2008

##### HMIS (Hazardous Material Information System)

Health Hazard	2
Flammability	0
Physical Hazards	0

##### GHS and (EC) No. 1272/2008 classification

Skin irritation (Category 2)  
Eye irritation (Category 2A)  
Specific target organ toxicity – single exposure (Category 3)  
Reproductive toxicity (Category 2)  
Acute Oral Toxicity (Category 4)

#### 2.2 Label elements

Pictogram



**Corrosive**  
GHS05



**Health Hazard**  
GHS08

**Signal Word: Danger**

##### Hazard Statements

H302	Harmful if swallowed
H312	Harmful in contact with skin
H318	Causes serious eye damage
H332	Harmful if inhaled
H315	Causes skin irritation
H335	May cause respiratory irritation.
H361FD	May damage fertility. May damage the unborn child.

##### Precautionary Statements

P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P264	Wash hands thoroughly after handling
P271	Use only in a hood or in a well-ventilated area or outdoors.
P280	Wear protective gloves /protective clothing /eye protection/ face protection.
P302+P352	If on skin: Wash with excess soap and water
P304 + P340	If inhaled: Remove person to fresh air and rest in a position for comfortable breathing.
P305+P351+P338	If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present, and easy to do. Continue rinsing.

2.3 Other hazards – none to our knowledge

### 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1. Substances

**Synonyms:** Lithium tetra/meta borate, Lithium Tetraborate ( $\text{Li}_2\text{B}_4\text{O}_7$ ) / Lithium Metaborate ( $\text{LiBO}_2$ ), Fusion flux

**Formula, CAS and EC numbers as below:**

**Lithium Tetraborate ( $\text{Li}_2\text{B}_4\text{O}_7$ )** CAS# 12007-60-2; EC No. 234-514-3; **Molecular weight** 169.08, **Concentration:** 0 - 100%

**Lithium Metaborate ( $\text{LiBO}_2$ )** CAS# 13453-69-5, EC No. 236-631-5. **Molecular weight** 49.75, **Concentration:** 0 - 100%

Or any proportional pre-fused combination of the above previous 2 substances

**with or without the following minor additions fused in or added post fusion**

0.1 – 4.0%	Lithium Bromide	LiBr	(CAS# 7550-35-8)	EC No. (231-439-8)
0.1 – 1.5%	, Lithium Iodide	LiI	(CAS# 10377-51-2)	EC No. (233-822-5)
0.5 – 4.0%	Potassium Iodide	KI	(CAS# 7861-11-0)	EC No. (231-659-4)
0.2 – 4.0%	Sodium Iodide	NaI	(CAS # 7681-82-5)	EC No. (231-679-3)
0.2 – 2.0%	Ammonium Iodide	$\text{NH}_4\text{I}$	(CAS # 12027-06-4)	EC No. (234-717-7)
0.1 – 10.0%	Lithium Fluoride	LiF	(CAS # 7789-24-4)	EC No. (232-152-0)
0.1 – 20.0%	Sodium Carbonate	$\text{Na}_2\text{CO}_3$	(CAS # 6132-02-1)	EC No. (207-838-8)
0.2 – 1.0%	Tantalum oxide	$\text{Ta}_2\text{O}_5$	(CAS # 1314-61-0)	EC No. (215-238-2)
0.2 – 1.0%	Thulium oxide	$\text{Tm}_2\text{O}_3$	(CAS # 12036-44-1)	EC No. (234-851-6)

**with or without the further addition of**

2 – 25%, Sodium Nitrate	$\text{NaNO}_3$	(CAS# 7631-99-4)	EC No. (231-554-3) or
1 - 30%, Lithium Nitrate	$\text{LiNO}_3$	(CAS# 7790-69-4)	EC No. (232-218-9)

No ECCN number is required.

### 4. FIRST AID MEASURES

#### 4.1. Description of first aid measures

**If inhaled**

Supply fresh air. If not breathing, give artificial respiration. Keep patient warm. Seek immediate medical attention.

**In case of skin contact**

Immediately wash with water and soap and rinse thoroughly. Seek immediate medical advice.

**In case of eye contact:**

Rinse opened eye for several minutes under running water. Consult a doctor.

**In case of swallowing**

Seek immediate medical attention. The following symptoms may occur: Gastric or intestinal disorders, nausea, cramps.

#### 4.2. Most important symptoms and effects, both acute and delayed.

Ingestion may result in nausea, vomiting and/or diarrhoea.

#### 4.3. Indication of any immediate medical attention and special treatment needed.

Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

### 5. FIREFIGHTING MEASURES

#### 5.1. Extinguishing media

**Suitable extinguishing media**

Product is not flammable. Use water or fire-fighting measures that suit the surrounding fire.

#### 5.2. Special hazards arising from the substance or mixture

Boron oxides. Lithium oxides. Metal oxides.

Not combustible.

#### 5.3. Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary. Wear fully protective impervious suit.

#### 5.4. Further information

Prevent fire extinguishing water from contaminating surface water or the drain water system.

### 6. ACCIDENTAL RELEASE MEASURES

#### 6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Wear protective equipment. Keep unprotected persons away. Ensure adequate ventilation. Avoid contact with skin and eyes. Avoid inhalation of dusts.

## 6.2. Environmental precautions

Use appropriate containment to avoid environmental contamination. Prevent from entering drains, ditches, or rivers by using appropriate barriers. Avoid subsoil penetration.

## 6.3. Methods and materials for containment and cleaning up

Shovel into a suitable clearly marked container for disposal or reclamation in accordance with local regulations. Avoid generation of dusts.

## 6.4. Reference to other sections

For disposal see section 13.

## 7. HANDLING AND STORAGE

### 7.1. Precautions for safe handling

Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

### 7.2. Conditions for safe storage, including any incompatibilities.

Store in cool place. Keep container tightly closed in a dry and well-ventilated place.

### 7.3. Specific end uses

Keep in original container.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1. Control parameters

Properly operating chemical fume hood designed for hazardous materials.

### 8.2. Exposure controls

#### Appropriate engineering controls

General industrial hygiene practice. Local exhaust ventilation is a requirement if the generation of dust is likely.

#### Personal protective equipment

##### Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

##### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

##### Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

##### Respiratory protection

Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).



## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1. Information on basic physical and chemical properties

Appearance	<b>Form:</b> powder, granular or microbeads <b>Colour:</b> white
Odour	no data available
Odour Threshold	no data available
pH	no data available
Melting point/melting range	825 - 925°C
Initial boiling point and boiling range	Solid which melts above 300°C
Flash point	No flashpoint as the substance is inorganic
Evaporation rate	no data available
Flammability (solid, gas)	The product is not flammable
Upper/lower flammability or explosive limits	no data available
Vapour pressure	no data available
Vapour density	no data available
Relative density	2.18 - 2.349
Water solubility	141.2 g/L at 20°C
Partition coefficient: n-octanol/water	Substance is inorganic.
Autoignition temperature	no data available
Decomposition temperature	no data available
Viscosity	no data available

Explosive properties	Non-explosive
Oxidizing properties	Non-oxidising

## 9.2. Other safety information

No data available

## 10. STABILITY AND REACTIVITY

### 10.1. Reactivity

Not classified as a reactivity hazard.

### 10.2. Chemical stability

Stable under normal conditions.

### 10.3. Possibility of hazardous reactions

Violent reactions possible with:

Strong oxidising acids.

### 10.4. Conditions to avoid

No data available

### 10.5. Incompatible materials

Strong oxidizing agents, acids

### 10.6. Hazardous decomposition products

Other decomposition products - No data available

## 11. TOXICOLOGICAL INFORMATION

### 11.1. Information on toxicological effects

#### Toxicokinetics, metabolism and distribution

A toxicokinetic assessment was performed based on the available data of dilithium tetraborate. Based on the physical/chemical properties of dilithium tetraborate, absorption factors for this substance are derived to be 100% (oral), 100% (inhalation of aqueous aerosols) and 0.5 % (dermal absorption from aqueous solutions) for risk assessment purposes. The bioaccumulation potential is expected to be low.

Lithium metaborate is sufficiently similar in terms of physicochemical properties and behaviour upon absorption that the same absorption factors can be used.

#### Acute toxicity

The oral LD50 value of dilithium tetraborate in Wistar rats was established to be within the range of 300-2000 mg/kg body weight.

According to the OECD 423 test guideline, the LD50 cut-off value was considered to be 500 mg/kg body weight.

On the basis of the acute toxicity by the oral route study, dilithium tetraborate is classified as Category 4, H302: Harmful if swallowed. The assessment is applied to all substances in this category including lithium metaborate.

#### Skin corrosion/irritation

An OECD 431 and OECD 439 were conducted on dilithium tetraborate and found to be non-corrosive and non-irritant. Variations in the structure (trigonal vs tetrahedral) between the substances are not expected to lead to any changes in corrosivity/irritancy as at physiological pH, all the substances dissociate to provide the same common compounds. All substances in the category do not meet CLP criteria for classification as skin irritants/corrosion.

#### Serious eye damage/eye irritation

An OECD 405 was conducted with dilithium tetraborate. Based on the not fully recovered effects on the cornea and conjunctivae of one animal after 21 days, dilithium tetraborate should be classified in accordance with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) of the United Nations (2015) / Regulation (EC) No 1272/2008 (including all amendments) as Category 1 - causes serious eye damage. Variations in the structure (trigonal vs tetrahedral) between the substances are not expected to lead to any changes in corrosivity as at physiological pH as all the substances dissociate to provide the same common compounds. All substances in the category will be classified as Category 1 - causes serious eye damage.

#### Respiratory or skin sensitization

Based on the available in vivo test data for analogous substances which indicate an absence of skin sensitising effect, an absence of evidence from widespread consumer and occupational use of inorganic borates and very low dermal penetration, it can be concluded that all lithium borates are unlikely to cause sensitisation by skin contact.

#### Germ cell mutagenicity

No data available

#### Carcinogenicity

No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

#### Reproductive toxicity

In a combined 28 -day repeated dose toxicity study with the reproduction/developmental toxicity screening test (OECD TG 422) of dilithium tetraborate by oral gavage in rats using doses 0, 15, 50 and 150 mg/kg/day, no treatment-related changes were noted the reproductive parameters examined in this study (i.e. mating and fertility indices, pre-coital time, number of implantation sites, estrous cycle, spermatogenic profiling, and histopathological examination of reproductive organs) up to the highest dose level tested (150 mg/kg). The NOAEL (reproductive effects) based on the outcome of this study is therefore 150 mg/kg (bw). On the basis of the developmental effects observed in the oral gavage OECD TG 422 study with lithium tetraborate, a classification of Category 2 – 361fd: Suspected of damaging the unborn child.

#### Specific target organ toxicity - single exposure

no data available

#### Specific target organ toxicity - repeated exposure



#### 14.6. Special precautions for user

No data available

#### 14.7. Maritime transport in bulk according to IMO instruments.

Not classified as dangerous in terms of transport regulations. See section 16.

### 15. REGULATORY INFORMATION

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.

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

WHMIS (Workplace Hazardous Materials Information System) – This product is not regulated and has been classified in accordance with the Controlled Products regulations.

National regulations All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical Substance Inventory. Information about limitation of use: For use only by technically qualified individuals.

Products are not listed in the Bureau of Industry and Security, US Department of Commerce, Commercial Control List (CCL) and are therefore designated as EAR99.

No ECCN number needed.

#### 15.2. Chemical Safety Assessment

No data available

### 16. OTHER INFORMATION

#### Further information / Transport

If sodium nitrate (CAS # 7631-99-4) 2-25% or lithium nitrate (CAS # 7790-69-4) 1 - 20% is added with or without 0.1 – 1.5% lithium bromide or lithium iodide 0.1 – 1.0% to the above formulations of x-ray flux, then the resultant mixture is not hazardous for transportation according to the following information:

The lithium tetra/meta borate mixture pre-fused with or without the addition of lithium bromide 0.1 – 1.5% or lithium iodide 0.1 – 1.0% has a minor sodium nitrate or lithium nitrate component added post fusion which by themselves are oxidizing however the total mixture is not classified as oxidizing according to the

“Manual of Tests and Criteria”, Part 3, subsection 34.4.1

Substance	Substance/cellulose ratio	Average combustion time (s)
Reference material (potassium bromate/cellulose)	3:7	116 for complete combustion
Lithium tetra/meta borate with or without 0.1 – 1.5% lithium bromide or 0.1 – 1.0% lithium iodide plus 2 - 25% sodium nitrate or 1 - 20% lithium nitrate	1:1 and 4:1	Greater than 169 seconds with very little (no noticeable) combustion

For the above total sample mixture of lithium tetra/meta borate with or without lithium bromide or lithium iodide but plus 2 - 25% sodium nitrate or 1-20% lithium nitrate, the 1:1 and the 4:1 mixture had a greater mean burning time than the 3:7 reference mixture. Both the 1:1 and the 4:1 mixture reacted very little by the end of the combustion period because the lithium tetra/meta borate part of the mixture is actually a fire retardant.

According to the UN Manual of Tests and Criteria, any substance which, for mixtures of sample/cellulose in proportions of both 1:1 and 4:1, has mean burning times greater than a 3:7 potassium-bromate/cellulose mixture, is not classified in class 5.1 as an oxidising substance. Based on this information the lithium tetra/meta borate with or without lithium bromide 0.1 – 1.5% or lithium iodide 0.1 – 1.0% but plus 2 – 25% sodium nitrate or 1 - 20% lithium nitrate has none of the properties which meet the UN criteria for oxidizing solids.

**The mixture does not have oxidizing properties within the meaning of the criteria established in the UN Manual of Tests and Criteria in the United Nations Recommendations on the Transport of Dangerous Goods, section 34.4.1.4.**

#### Disclaimer

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#### References

ECHA Guidance on the Application of the CLP Criteria Guidance to Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP) of substances and mixtures Version 5.0 July 2017

Globally Harmonized System of Classification and Labelling of Chemicals(GHS) (Tenth revised edition, New York and Geneva, 2023, ISBN 9789211173048, ST/SG/AC.10/30/Rev.10 (“GHS Rev.10”)

United Nations Economic Commission for Europe. (2017). Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria (Rev. 7).

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