SAFETY DATA SHEET

(Following Regulations (EC) No 1907/2006 & (EC) No 1272/2008)

SDS Number: 408           Date of first issue: 01 December 2002           Date of last revision: 01 June 2015

1 - Identification of product

1.1 - Identification of Product

Tradenames: Kaowool 1600 Paper,

The above-mentioned product contains polycrystalline fibres and mineral wool.

1.2 - Use of Product

Application as thermal insulation, heat shields, heat containment, gaskets and expansion joints at temperatures up to 1600°C in industrial furnaces, ovens, kilns, and other process equipment and in the aerospace, automotive industries.

1.3 - Identification of Company

U.K. THERMAL CERAMICS LIMITED
Tebay Road, Bromborough
Wirral, Merseyside CH62 3PH
Tel.: +44 (0) 151 334 4030
Fax: +44 (0) 151 334 1684

1.4 - Emergency information

Tel: + 44 (0) 7931 963 973
Language: English
Opening hours: Only available during office hours

2 - Hazard Identification

2.1 - Classification of the substance/ mixture

2.1.1 CLASSIFICATION OF THE SUBSTANCE/MIXTURE

Mineral wools (glass, rock and slag wool) included in these products have been classified under Regulation no. 1272/2008 as a category 2 carcinogen ("substance which cause concern for man owing to possible carcinogen effects") due to the absence of toxicological data allowing to exonerate these fibres under note Q of the Directive.

2.2 - Labelling Elements

No labelling required as product is considered an article under REACH and CLP regulations.

2.3 - Other hazards which do not result in classification

Mild mechanical irritation to skin, eyes and upper respiratory system may result from exposure.
These effects are usually temporary
3 - Composition / Information On Ingredients

Description

3.2 Mixture

These products are papers made of organic bonded polycrystalline fibres and mineral wool.

Composition

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>%</th>
<th>CAS Number</th>
<th>REACH Registration Number</th>
<th>Hazard Classification according to CLP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polycrystalline fibre</td>
<td>80- 100</td>
<td>675106-31-7</td>
<td>01-2119456884-25</td>
<td>Not classified as hazardous</td>
</tr>
<tr>
<td>Mineral wool</td>
<td>0-10</td>
<td>65997-17-3</td>
<td>Not yet available</td>
<td>Not classified as hazardous</td>
</tr>
<tr>
<td>Organic binder</td>
<td>3-10</td>
<td>Not applicable</td>
<td>Not yet available</td>
<td>Not classified as hazardous</td>
</tr>
</tbody>
</table>

Composition additional information

The paper contains between 3% and 10% by weight of crosslinked acrylic esters which are insoluble in water and non-hazardous in nature.

None of the components are radioactive under the terms of European Directive Euratom 96/29.

4 - First-Aid measures

4.1 - Description of First Aid Measures

Skin

Handling of this material may generate mild mechanical temporary skin irritation. If this occurs, rinse affected areas with water and wash gently. Do not rub or scratch exposed skin.

Eyes

In case of eye contact flush abundantly with water; have eye bath available. Do not rub eyes. Seek medical attention if irritation persists.

Nose and Throat

If these become irritated move to a dust free area, drink water and blow nose. Seek medical attention if irritation persists.

first aid additional information

If symptoms persist, seek medical advice.

4.2 - Most Important symptoms and effects, both acute and delayed

No symptoms or effects expected either acute or delayed

4.3 - Indication of any immediate medical attention and special treatment required

No special treatment required, if exposure occurs wash exposed areas to avoid irritation.

5 - Fire-fighting measures

5.1 - Extinguishing media

Use extinguishing agent suitable for surrounding combustible materials.

5.2 - Special hazards arising from the substance or mixture

Non combustible products. However, virgin product binder may burn and produce gases and/or fumes.

5.3 - advice for firefighters

Packaging and surrounding materials may be combustible.
6 - Accidental Release Measures

6.1 - Personal precautions, protective equipment and emergency procedures

Where abnormally high dust concentrations occur, provide the workers with appropriate protective equipment as detailed in section 8. Restore the situation to normal as quickly as possible.

6.2 - Environmental precautions

Prevent further dust dispersion for example by damping the materials. Do not flush spillage to drain and prevent from entering natural watercourses. Check for local regulations, which may apply.

6.3 - Methods and materials for containment and clean up

Pick up large pieces and use a vacuum cleaner. If brushes are used, ensure that the area is wetted down first. Do not use compressed air for clean up. Do not allow to become windblown.

6.4 - Reference to other sections

For further information, please refer to sections 7 and 8

7 - Handling and storage

7.1 - Precautions for safe handling

Handling can be a source of dust emission and therefore the processes should be designed to limit the amount of handling. Whenever possible, handling should be carried out under controlled conditions (i.e., using dust exhaust system). Regular good housekeeping will minimise secondary dust dispersal.

7.2 - Conditions for safe storage

Store in original packaging in a dry area. Always use sealed and clearly labelled containers. Avoid damaging containers. Reduce dust emission during unpacking.

7.3 - Specific end use

The main application of these products is as thermal insulation. Please refer to your local Morgan Thermal Ceramics’ supplier.
8 - Risk Management Measures / Exposures Controls / Personal Protection

8.1 - Control parameters

Industrial hygiene standards and occupational exposure limits vary between countries and local jurisdictions. Check which exposure levels apply to your facility and comply with local regulations. If no regulatory dust or other standards apply, a qualified industrial hygienist can assist with a specific workplace evaluation including recommendations for respiratory protection. Examples of national OELs (November 2014) are given in the table below.

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>Total Dust (mg/m³)</th>
<th>Resp Dust (mg/m³)</th>
<th>MMMF (fibre/ml)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>10</td>
<td>6</td>
<td>1</td>
<td>Grenzwerteverordnung</td>
</tr>
<tr>
<td>Belgium</td>
<td>10</td>
<td>3</td>
<td>1</td>
<td>Valeurs limites d'exposition professionnelle – VLEP/ Grenswaarden voor beroepsmatig blootstelling – GWBB</td>
</tr>
<tr>
<td>Denmark</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>Grænseværdier for stoffer og materier</td>
</tr>
<tr>
<td>Finland</td>
<td>No limit</td>
<td>No limit</td>
<td>1</td>
<td>Finnish Ministry of Social Affairs and Health</td>
</tr>
<tr>
<td>France</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>Institut National de Recherche et de Sécurité</td>
</tr>
<tr>
<td>Germany</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td>TRGS 900</td>
</tr>
<tr>
<td>Hungary</td>
<td>No limit</td>
<td>No limit</td>
<td>1</td>
<td>EüM-SZCSM rendelet</td>
</tr>
<tr>
<td>Ireland</td>
<td>10</td>
<td>4</td>
<td>1</td>
<td>HAS – Ireland</td>
</tr>
<tr>
<td>Italy</td>
<td>10</td>
<td>3</td>
<td>1</td>
<td>Uses EU values</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>10</td>
<td>6</td>
<td>1</td>
<td>Agents Chimiques, Cancérogènes Ou Mutagènes Au Travail</td>
</tr>
<tr>
<td>Netherlands</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>Veiledning om administrative normer for forurensing i arbeidsatmosfære</td>
</tr>
<tr>
<td>Norway</td>
<td>10</td>
<td>5</td>
<td>0.5</td>
<td>SER</td>
</tr>
<tr>
<td>Poland</td>
<td>No limit</td>
<td>No limit</td>
<td>2</td>
<td>Dziennik Ustaw 2010</td>
</tr>
<tr>
<td>Spain</td>
<td>10</td>
<td>3</td>
<td>1</td>
<td>INSHT</td>
</tr>
<tr>
<td>Sweden</td>
<td>10</td>
<td>5</td>
<td>1</td>
<td>AFS 2005:17</td>
</tr>
<tr>
<td>Switzerland</td>
<td>10</td>
<td>6</td>
<td>1</td>
<td>SUVA - Valeurs limites d'exposition aux postes de travail</td>
</tr>
<tr>
<td>UK</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>EH40/2005</td>
</tr>
</tbody>
</table>

Information on monitoring procedures

United Kingdom

MDHS 59 specific for MMVF: “Man-made mineral fibre - Airborne number concentration by phase-contrast light microscopy” and MDHS 14/4 “General methods for sampling and gravimetric analysis of respirable and inhalable dust”

NIOSH

NIOSH 0500 "Particulates not otherwise regulate, total"
NIOSH 0600 "Particulates not otherwise regulate, respirable"
NIOSH 7400 "Asbestos and other fibres by PCM"

8.2 - Exposure controls

8.2.1 APPROPRIATE ENGINEERING CONTROLS

Review your applications in order to identify potential sources of dust exposure. Local exhaust ventilation, which collects dust at source, can be used. For example down draft tables, emission controlling tools and materials handling equipment.

Keep the workplace clean. Use a vacuum cleaner. Avoid brushing and compressed air.
If necessary, consult an industrial hygienist to design workplace controls and practices. The use of products specially tailored to your application(s) will help to control dust. Some products can be delivered ready for use to avoid further cutting or machining. Some could be pre-treated or packaged to minimise or avoid dust release during handling. Consult your supplier for further details.

8.2.2 - Personal Protective Equipment

Skin protection:
Wear gloves and work clothes, which are loose fitting at the neck and wrists. Soiled clothes should be cleaned to remove excess fibres before being taken off (e.g. use vacuum cleaner, not compressed air). Wash work clothes separately from other clothing.

Eye protection:
As necessary wear goggles or safety glasses with side shields.

Respiratory protection:
For dust concentrations below the exposure limit value, RPE is not required but FFP2 respirators may be used on a voluntary basis. For short-term operations where excursions are less than ten times the limit value use FFP2 respirators.
In case of higher concentrations or where the concentration is not known, please seek advice from your company and/or local Thermal Ceramics supplier.

Information and training of workers
Workers should be trained on good working practices and informed on applicable local regulations.

8.2.3 - Environmental Exposure Controls

Refer to local, national or European applicable environmental standards for release to air water and soil. For waste, refer to section 13.
9 - Physical and chemical properties

Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>White paper</td>
</tr>
<tr>
<td>Odour</td>
<td>Slight</td>
</tr>
<tr>
<td>Odour threshold</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>pH</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>&gt; 2000°C</td>
</tr>
<tr>
<td>Initial boiling point and boiling point range</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>The material will burn for a short period only until the polymeric binder is burnt out or the resulting expansion self-extinguishes</td>
</tr>
<tr>
<td>Upper/lower flammability or explosive limits</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Vapour pressure</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Vapour density</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Relative density</td>
<td>90-210kg/m³</td>
</tr>
<tr>
<td>Solubility(ies)</td>
<td>Less than 1 mg/l</td>
</tr>
<tr>
<td>Partition co-efficient: n-octanol/water</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Oxidising properties</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

10 - Stability and Reactivity

10.1 - Reactivity
AES is stable and non reactive

10.2 - Chemical Stability
The product is inorganic, stable and inert

10.3 - Possibility of Hazardous Reactions
During first heating, oxidation products from the organic binder might be emitted in a temperature range from 180°C to 600°C. It is recommended to ventilate the room until gases and fumes have disappeared. Avoid exposure to high concentrations of gas or fumes.

10.4 - Conditions to Avoid
Please refer to handling and storage advice in Section 7

10.5 - Incompatible Materials
Concentrated mineral acids or bases

10.6 - Hazardous decomposition products
Decomposition of the polymeric binder will occur at temperatures above 200°C releasing smoke, water, carbon monoxide, carbon dioxide and hydrocarbons. The duration and the amount of release will depend upon the applied temperature, the thickness and area of the material and binder content. Removal of the binder will release the fibres unless they are physically constrained. During the first heating cycles increased ventilation or the use of suitable respirator protection may be required.

Hazardous polymerisation will not occur.
11 - Toxicological information

Toxicokinetics, metabolism and distribution

11.1.1 Basic toxicokinetics
Exposure is predominantly by inhalation or ingestion. Polycrystalline fibres have not been shown to migrate from the lung and/or gut and do not become located in other organs of the body. Available toxicological information is as follows:

11.1.2 HUMAN TOXICOLOGICAL DATA
Epidemiology of Mineral Wools
Epidemiological studies did not show any health effects related to fibres among Mineral Wool manufacturing workers. The excess of lung cancers reported in 1982 have been the subject of additional investigations and the examination of the confounding factors showed that the excess were not attributed to fibres. Smoking has been identified as the most important of these confounding factors.

11.1 - Information on toxicological effects

Experimental Studies for Mineral Wools
Animal inhalation studies on mineral wools showed neither pulmonary fibrosis nor lung cancer nor mesothelioma. Intratracheal and intraperitoneal injection studies did not show any disease except those involving selected fine glass fibres for special uses or experimental rock wools.

Experimental Studies for Polycrystalline Wool
Lifetime rat inhalation studies in the rat on PCW fibres at the maximum levels achievable have shown no evidence of lung cancer, lung fibrosis or any other adverse effect, apart from a minimal pulmonary response typical of that of a 'low toxicity dust'. Also, a lifetime feeding study in rats has produced no evidence of any adverse effects at levels up to 2.5 % in the diet. Intraperitoneal, intratracheal and intrapleural studies in rats, together with two in vitro tests, all showed negative results whereas asbestos and crystalline silica which were used as positive controls (where relevant) produced positive responses.

The results of these extensive testing programmes indicate that PCW materials lack one or more of the fundamental characteristics necessary for mesothelioma induction, as well as not possessing fibrogenic potential.

Irritant properties
When tested using approved methods (as listed in Regulation (EC) 1907/2006, Annex 8, Section 8.1), fibres contained in this material give negative results. All man-made mineral fibres, like some natural fibres, can produce a mild irritation resulting in itching or rarely, in some sensitive individuals, in a slight reddening. Unlike other irritant reactions this is not the result of allergy or chemical skin damage but is caused by mechanical effects.

12 - Ecological information

a - Ecotoxicity (aquatic and terrestrial, where available)

12.1 - Toxicity
These products are inert materials that remain stable overtime. No adverse effects of this material on the environment are anticipated.

12.2 - Persistence and degradability
Not established

12.3 - Bioaccumulative potential
Not established

12.4 - Mobility in soil
No information available

12.5 - Results of PBT and vPvB assessment
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent and very bioaccumulative (vPvB).

12.6 - Other adverse effects
No additional information available
13 - Disposal Considerations

13.1 - Waste treatment methods

Waste from these materials may be generally disposed off at a landfill, which has been licensed for this purpose. Please refer to the European list (Decision N° 2000/532/CE as modified) to identify your appropriate waste number, and insure national and/or regional regulations are complied with.

Unless wetted, such a waste is normally dusty and so should be properly sealed in containers for disposal. At some authorised disposal sites, dusty waste may be treated differently in order to ensure they are dealt with promptly to avoid them being windblown. Check for any national and/or regional regulations, which may apply.

14 - Transport information

Transport

14.1. UN number
Not Applicable

14.2. UN proper shipping name
Not Applicable

14.3. Transport hazard class(es)
Not Applicable

14.4. Packing group
Not Applicable

14.5. Environmental hazards
Not Applicable

14.6. Special precautions for user
Not Applicable

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not Applicable

15 - Regulatory information

15.1 - Safety health and environment regulations/legislation specific for the substances or mixtures

EU regulations:
- Regulation (EC) No 1907/2006 dated 18th December 2006 on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
- Regulation (EC) No 1272/2008 dated 18th December 2006 on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

POLYCRYSTALLINE FIBRE
In Germany and in accordance with Technical Rules for Hazardous Substances TRGS905 (2.3. para. 6) inorganic fibrous dust is classified in category 3.
In 1988 IARC classified man-made mineral fibres as possible human carcinogens (2B) and, at that time PCWs were included in this broad category of materials. Current information on carcinogenicity is given in Section 11.

15.2 - Chemical Safety Assessment

Chemical Safety Reports have been requested from suppliers, as soon as this information is available it will be shared with downstream users.
16 - Other Information

Useful references

(the directives which are cited must be considered in their amended version)
- Regulation (EC) No 1907/2006 dated 18th December 2006 on registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

Precautionary measures

High concentrations of fibres and other dusts may be generated when after-service products are mechanically disturbed during operations such as wrecking. Therefore Morgan Thermal Ceramics recommends:
- control measures are taken to reduce dust emissions;
- all personnel directly involved wear an appropriate respirator to minimise exposure; and
- compliance with local regulatory limits.

CARE Program

The trade association representing the European high temperature insulation wool industry (ECFIA) has undertaken an extensive hygiene programme for High Temperature Insulation Wool (HTIW). The objectives are twofold: (i) to monitor workplace dust concentrations at both manufacturers' and customers' premises, and (ii) to document manufacturing and use of HTIW products from an industrial hygiene perspective in order to establish appropriate recommendations to reduce exposures. The initial results of the programme have been published. If you wish to participate in the CARE programme, contact ECFIA or your Thermal Ceramics' supplier.

Uses advised against

Website

For more information connect to:
The Morgan Thermal Ceramics' website: (http://www.morganthermalceramics.com/)
Or ECFIA's website: (http://www.ecfia.eu)

Revision Summary

Amendments to sections 2, 3, 4, 5, 6, 8, 9, 12, 14, 15 and 16 to comply with new guidelines

Technical data sheets

For more information on individual products please see the relevant technical data sheet available from
http://www.morganthermalceramics.com/downloads/datasheets

Other Information

NOTICE:
The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. However safe as provided by law, no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorisation given or implied to practice any patented invention without a licence. In addition, no responsibility can be assumed by the vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product (however, this shall not act to restrict the vendor’s potential liability for negligence or under statute).