

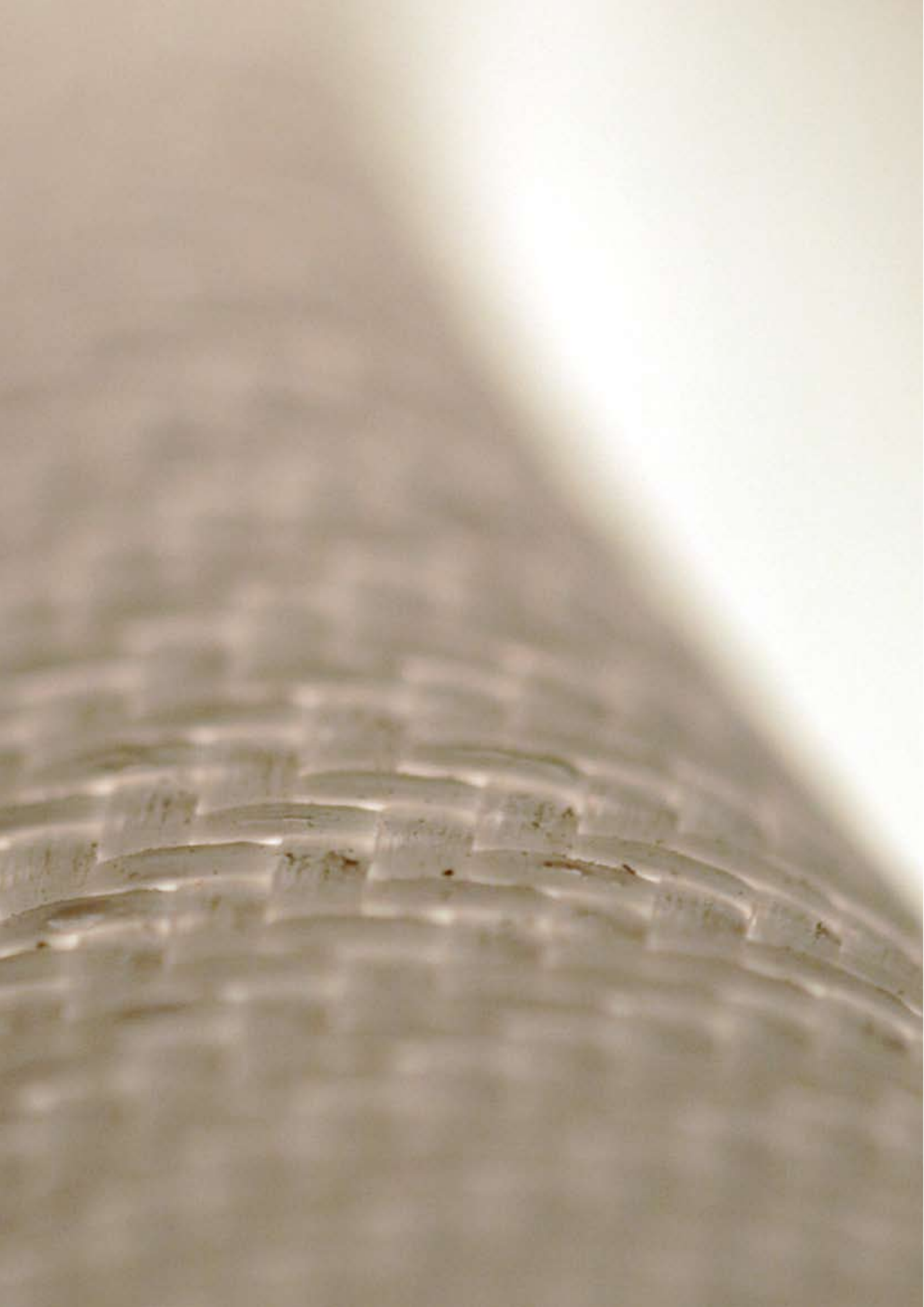
HILTEX ALF

Hiltex boron-free continuous alumina-silica fiber

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Introduction

HILTEX Continuous Alumina Fiber “HILTEX ALF” was jointly developed with HILTEX. It is based on the strong combination of dry spinning technology and extensive experience in fibrous refractory manufacturing technology.

HILTEX ALF is a boron-free alumina-silica fiber that is composed of Al_2O_3 (alumina) and SiO_2 (silica), that are commonly known as representatives of stable metal oxide materials. No other ingredients are included in HILTEX ALF but alumina and silica.

HILTEX ALF are polycrystalline filaments whose crystal type is gamma alumina and amorphous silica. HILTEX ALF has accomplished excellent flexibility and strength without B_2O_3 (Boron) because of the fine filament diameter, which is offered in 7-10 micron diameter.

HILTEX ALF yarn is made up of thousands of continuous and strong filaments that gives it excellent flexibility and allows it to be readily transformed into various textile forms such as woven fabrics, braided sleeves, tapes, ropes and sewing threads without the aid of any other organic fibers or metal fibers.

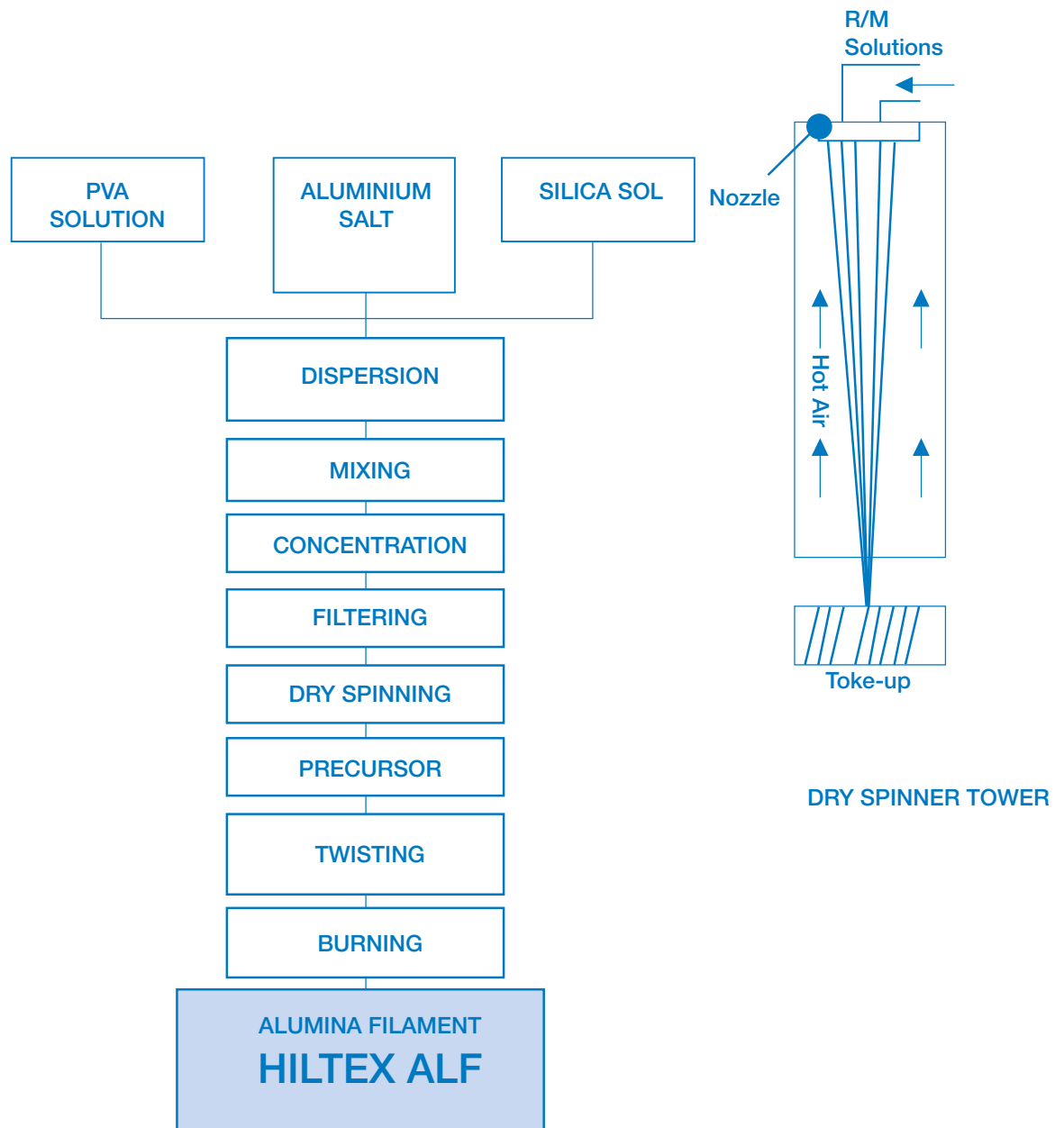
HILTEX ALF offers good chemical resistance, thermal shock resistance and electrical insulation properties. At present, there is growing interest in HILTEX ALF filament yarn for use in a wide range of applications, in high temperature environment.



Manufacturing process

HILTEX ALF is produced by burning of precursor, made by special dry spinning technology. It is prepared by a mixture of aluminium salt solution, silica sol and PVA(poly-vinyl-alcohol).

Fig.1 Production Process of HILTEX ALF



Characteristics

1. Excellent thermal resistance.
(HILTEX ALF retains strength and flexibility after exposure in high temperature environment.)
2. Great flexibility for the making of textiles.
3. Superior thermal insulation properties.
4. High tensile strength and modulus.
5. Superior electrical insulation properties.
6. Resists corrosion.
7. Does not absorb moisture.

Typical applications

1. Thermal insulation rings (disks and collars) for diffusion furnaces used in the semi-conductor manufacturing process.
2. Furnace linings.
3. Heat-Shielding curtains.
4. Thermal insulation seals and packing materials.
5. Thermal insulation coverings for thermocouple cables and wires.
6. Roller covering for tempered glass plate manufacturing.
7. Filters for molten aluminium or other metals.
8. Spacers for heat treatment of metal or other materials.
9. Abrasives for plastic whetstones.
10. Insulators around generator and aircraft/rocket engines.
11. Catalyst carries.
12. Electrical and thermal insulators for diesel particulate filter(DPF) systems.
13. And many other applications.

Fiber selection guide

HILTEX ALF boron-free continuous Alumina-Silica fiber is classified into three types with different ratio of Alumina and Silica.

Alumina/silica ratios: 60/40%, 72/28% and 80/20%

Briefly, hardness of the fiber and the max temperature for continuous use goes up as ratio of alumina increases.

HILTEX ALF 60/40

HILTEX ALF 60/40 type has excellent flexibility and softness due to containing 40% of Silica. HILTEX ALF 60/40 type can continuously resist temperatures up to 1200 .

HILTEX ALF 72/28

HILTEX ALF72/28 type is the regular type of HILTEX ALF. Most of our products are made by using HILTEX ALF 72/28 yarn.

This type of yarn can continuously resist temperatures up to 1250°C.

HILTEX ALF 80/20

HILTEX ALF 80/20 type has the best thermal resistance and hardness among all type of HILTEX ALF. This type can continuously resist the temperatures up to 1300°C.

Sizing, Heat cleaning

All types of HILTEX ALF are produced using organic sizing (polyurethane).

This organic sizing gives HILTEX ALF products, stability during the process of weaving, braiding and so on.

However organic sizing generate some smoke during usage first time at high temperature.

For some applications this is a unwanted effect. In these cases we recommend to remove the seizing prior before usage by heat cleaning:

Atmosphere	Active condition (oxidation)
Temperature	850°C × 2hr
Equipment	Recommended is to use equipment that has exhaust ventilation like an exhaust enclosure or hood.

Heat cleaning, to remove the organic sizing generates thermal decomposition products. Carbon monoxide is the predominant decomposition products. Recommended is to control carbon monoxide concentrations to the ACGIH Threshold Limit Value of 25ppm(8hr TWA), also other decomposition products should also be adequately controlled.

The supplementary explanation in terms of technical information

The crystal phases of HILTEX ALF is comprised are fine size of crystals, which are a mixture of alumina and amorphous SiO₂. This combination gives HILTEX ALF flexibility and perfect tensile strength. At the case of exposure to more than 1200°C, the crystal phases initiate to change into unstable phases, such as α -alumina, θ -alumina and mullite. In addition, the size of the crystals is growing at exposure of even higher temperatures. This phenomena causes decrease in flexibility and the tensile strength of HILTEX ALF. For instance, the strength retention of HILTEX ALF is approximately 50% after 24hrs at 1200°C.

In actual cases HILTEX ALF can be used over 1200°C giving HILTEX ALF still enough tensile strength and flexibility for usage in many applications, despite the changing of the crystal phase and growing size of the crystal.

The maximum temperature we recommend, is based on our various experiences of the usage of HILTEX ALF.

Shrinkage

Regarding “shrinkage”, HILTEX ALF shrinks approximately 2% after being exposed at 1300°C for 24hrs as a result of transition of crystal type or phase from γ -Alumina and amorphous SiO₂” to Mullite.

Weight loss

There is no weight loss, except binder that vaporizes due to exposure to high temperature. This is different from products that contain boron.

Cold atmosphere

Additionally, HILTEX ALF is not affected in the atmosphere of extreme low temperatures like liquid nitrogen (-196°C).

Chemical resistance

(1). Acid

Usually, HILTEX ALF has a good resistance against Strong Acid even in at high temperature atmospheres, except phosphoric acid. HILTEX ALF can be used in conditions including acid gas such as Hydrochloric acid, Sulfuric acid and Nitric acid without any problems.

(2). Alkali

Commonly known strong alkali like Sodium hydroxide and Potassium hydroxide, which have a corrosive effect on HILTEX ALF. Ammonia is an exception as there is no reaction.

HILTEX ALF Typical Property

	Unit	60/40	72/28	80/20
Max use temperature	°C	1,200	1,250	1,300
Filament diameter	$\mu\text{m}\phi$	7	7	10
Density		2.8	2.9	3.0
Tensile strength	MPa	1,900	1,800	1,700
Tensile modulus	GPa	180	190	200
Chemical composition	%	Al ₂ O ₃ 60 SiO ₂ 40	Al ₂ O ₃ 72 SiO ₂ 28	Al ₂ O ₃ 80 SiO ₂ 20
Specific heat	J·K ⁻¹ ·g ⁻¹	0.759	0.763	0.767
Thermal expansion	$\times 10^{-6}/^{\circ}\text{C}$ 25~1,000°C	9.1	8.5	7.9
Melting point	°C Ω	>1,800	>1,850	>1,900
Dielectric constant	1MHz	1.23	1.44	1.64
Volume electrical resistance	Ω·cm	10 ¹⁵	10 ¹⁵	10 ¹⁵

Products list of HILTEX ALF Yarn

Type name	Form	Yarn diameter (mm)	Yield (g/1,000m)	Tensile strength (kgf/Yarn)	Chemical composition (%)
S-640D(7)	Two ply 34tex × 2	0.2	67	3	A/S=72/28
S-1280D(7)	Two ply 67tex × 2	0.3	133	5	A/S=60/40, 72/28
S-1920D(7)	Three ply 67tex × 3	0.5	200	7	A/S=60/40, 72/28
S-3840D(7)	Three ply 133tex × 3	0.6	400	12	A/S=60/40 72/28
S-960D(10)	Three ply 67tex × 3	0.6	200	6	A/S=80/20

Products list of HILTEX ALF Woven Fabric

1.A/S = 72/28 Composition

Type name	Weave	Width (mm)	Yarn type (g/1,000m)	Thickness (mm)	Thread count (Per Inch)		Weight (g/m ²)	Breaking Load (kgf/in)
					Warp	Fill		
3030-P	Plain	1,000	34	0.08 (0.10)	30	30	30	30
2525-P	Plain	1,000	67	0.12 (0.21)	25	25	128	50
2626-P	Plain	1,000	133	0.21 (0.31)	26	26	280	131
3025-T	Twill	1,000	200	0.35 (0.55)	30	25	440	193
2220-S	Satin	1,000	400	0.61 (0.97)	22	20	670	183
4018-D	Double twill	1,000	400	0.80 (1.35)	40	18	940	270

(): Measured by ASTM method

2.A/S = 80/20 Composition

Type name	Weave	Width (mm)	Yarn type (g/1,000m)	Thickness (mm)	Thread count (Per Inch)		Weight (g/m ²)	Breaking Load (kgf/in)
					Warp	Fill		
3025-T-E3	Twill	1,000	200	0.35 (0.55)	30	25	440	150

(): Measured by ASTM method

Products list of HILTEX ALF Woven Tape

1. A/S = 72/28 Composition

Type name	Weave	Width (mm)	Thickness (mm)	Weight (g/m)	Breaking Load (kgf/in)
TP-25S	Twill	25	0.32 (0.53)	11	130
TP-25D	Twill	25	1.30 (1.87)	37	450
TP-50S(T)	Twill	50	0.32 (0.45)	22	130
TP-50S(P)	Plain	50	0.32 (0.53)	22	130

(): Measured by ASTM method

2. A/S = 80/20 Composition

Type name	Weave	Width (mm)	Thickness(mm)	Weight (g/m)	Breaking Load (kgf/in)
TP-25S-E3	Twill	25	0.32 (0.53)	11	74

(): Measured by ASTM method

Products List of HILTEX ALF Braided Sleeve

1.A/S = 72/28 Composition

Type name	Inside diameter (mm)	Yarn type (g/1,000m)	*Weight (g/m)	Thickness (mm)	Picks
SV-1-SP	1	67	1.4	0.4	16
SV-1	1	133	2.3	0.8	16
SV-2	2	200	3.7	0.9	16
SV-3	3	200	9	1.0	16
SV-6	6	200	12	1.1	24
SV-10	10	200	20	1.2	40
SV-12	12	200	24	1.2	48
SV-16	16	200	39	1.3	64
SV-20	20	200	46	1.3	84

These nine types of sleeve have been used in general application such as covering material thermo couple cable and heat resistance electric cable.

2. A/S = 60/40 Composition

Type name	Inside diameter (mm)	Yarn type (g/1,000m)	*Weight (g/m)	Thickness (mm)	Picks
SV-32	32	200	108	1.4	64
SV-40	40	200	90	1.3	96
SV-50	50	200	128	1.2	96
SV-58	58-63	200	140	1.3	128
SV-63	63	200	160	1.5	128

**Weight is measured in the condition in which sleeves are inserted into appropriate rods, which have standard inside diameters of each sleeves.

Products List of HILTEX ALF Sewing Thread

(1)Hand sewing

		T-5760D(7)
Tensile strength (kgf/yarn)	Room temperature	20
	After800°C × 15min	21.7
Knot strength (kgf/yarn)	Room temperature	2.5
	After800°C × 15min	2.4
Yield (g/1,000m)		600(1,667m/kg)
Unit (g/ab.670m/bobbin)		400

(2)Machine sewing

		CT-2560D(7)	CT-5120D(7)
Tensile strength (kgf/yarn)	Room temperature	11	18
	800°C × 15min	9.5	18
	1,000°C × 24hr	8	16
Knot strength (kgf/yarn)	Room temperature	1.5	4.0
	800°C × 15min	0.9	2.8
Yield (g/1,000m)		300 (3,333m/kg)	610 (1,600m/kg)
Unit (g/m/bobbin)		350g (ab.1060m)	350 (ab.530m)

*Outside diameter is approximate size.

*HILTEX ALF Sewing thread for machine sewing is designed in the combination of HILTEX ALF and Rayon fibers.

The thermal conductivity of HILTEX ALF Fabric

1. Sample

Type name	Weave	Chemical composition (%)		Thread count (per inch)		Weight (g/m ²)	Thickness (mm)
		Al ₂ O ₃	SiO ₂	Warp	Fill		
3025-T	Twill	72	28	30	25	440	0.35 (0.55)

() : Measured by ASTM method

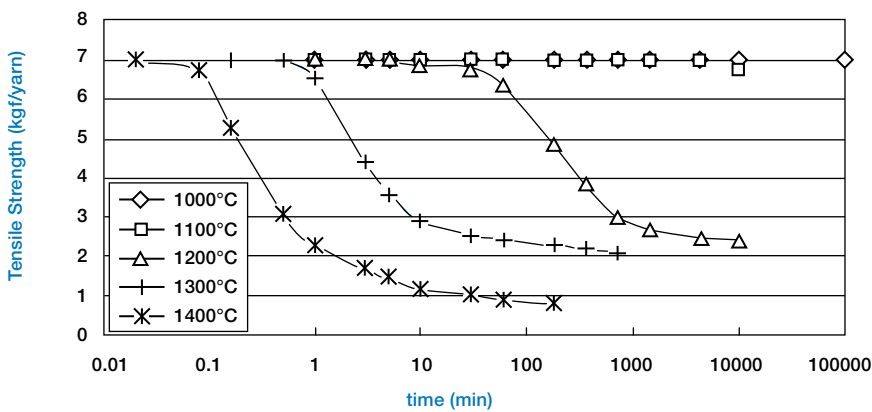
2. The thermal conductivity of ALF

Temperature (°C)	Thermal conductivity (kcal/m hr°C)
200	0.10
400	0.13
600	0.16
800	0.19
1,000	0.21

Strength at temperature

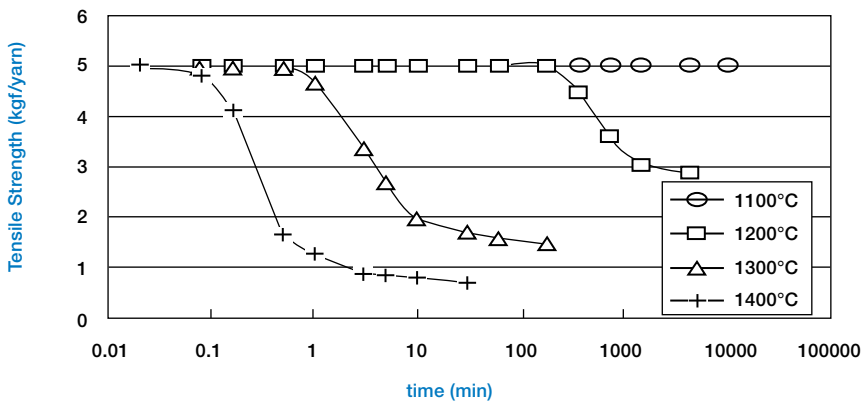
A/S=72/28

Changing of tensile strength of HILTEX ALF at temperature and time

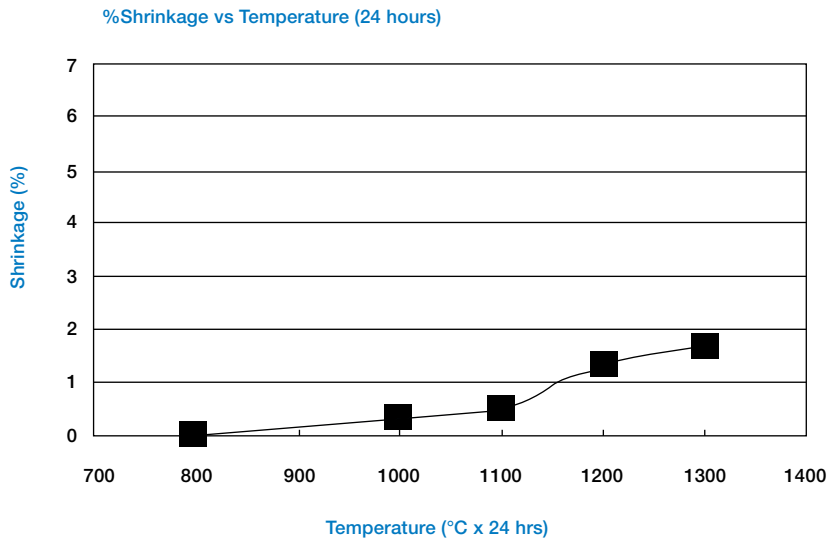


A/S=80/20

Changing of tensile strength at keeping temperature

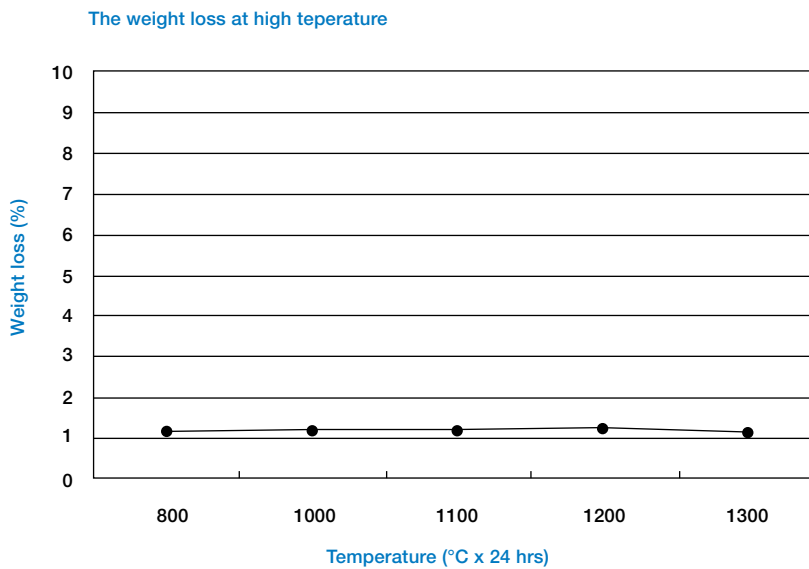


The shrinkage of HILTEX ALF(A/S=72/28)



The weight loss at high temperature

Following graph shows the weight loss at high temperature of HILTEX ALF



Hot Face vs. Cold Face Temperature

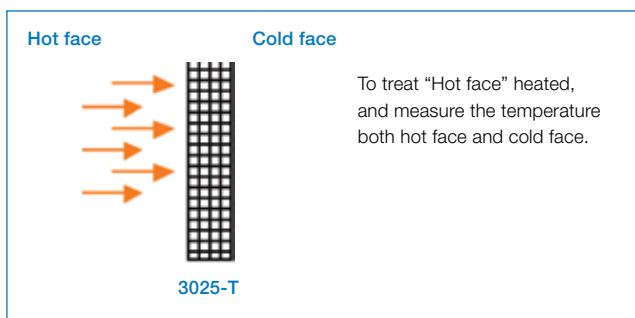
1. Sample

Woven fabric 3025-T

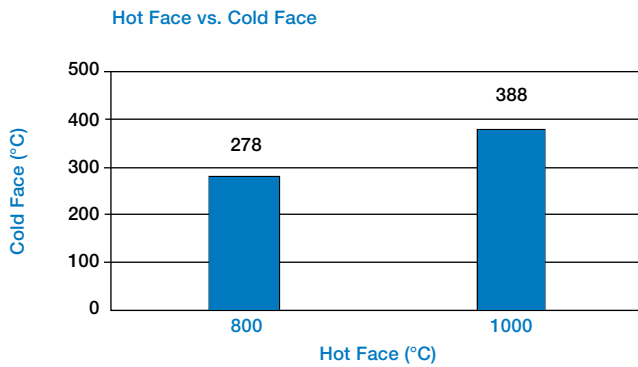
Type name	Weave	Yarn type (g/1,000m)	Thread count per inch		Weight (g/m ²)	Thickness (mm)
			Warp	Fill		
3025-T	Twill	200	30	25	440	0.35 (0.55)

(): Measured by ASTM method

2. The rough sketch of experiment

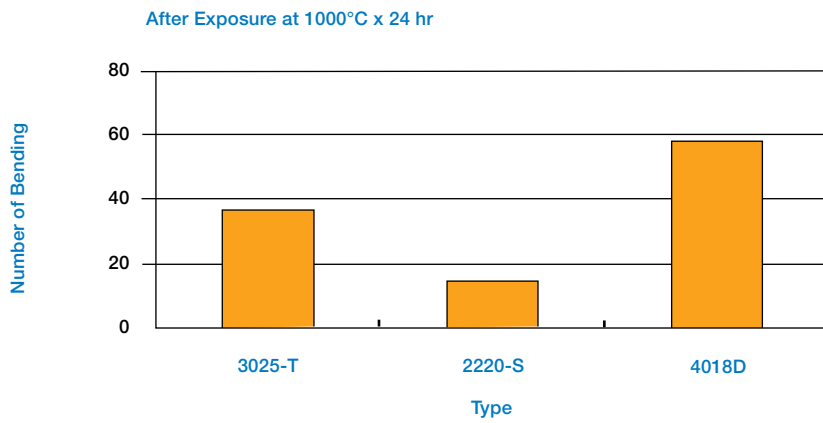
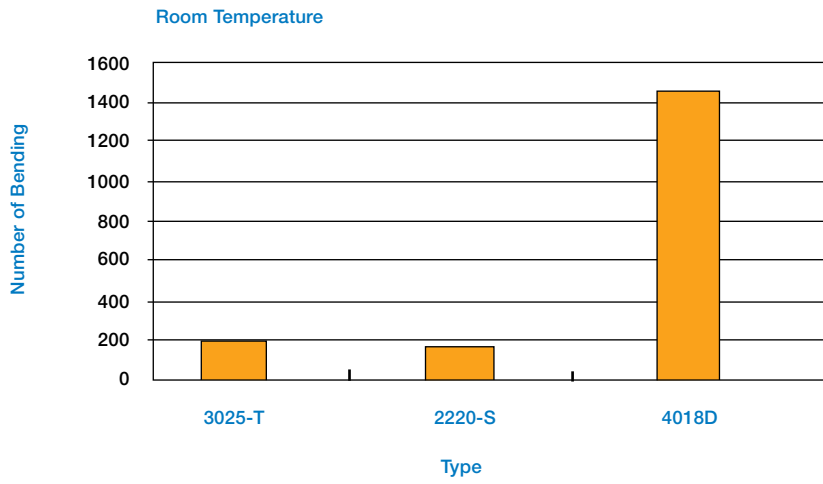


3. Result



The bending resistance

HILTEX ALF



The strength retention after treated at extreme cold atmosphere (The temperature of Liquid Nitrogen -196°C)

Table 1.

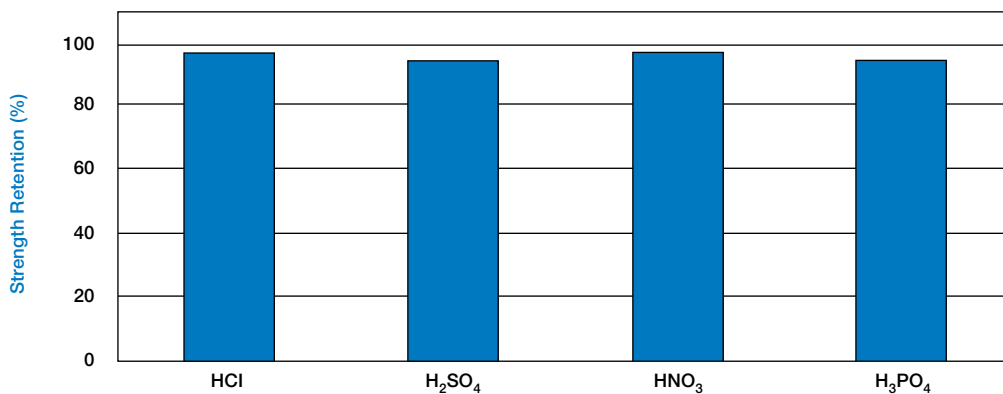
The strength retention and outside appearance after treated in liquid nitrogen

Sample	Time in liquid Nitrogen(-196°C)	Strength retention (%)	Outside appearance
S-1920D(7) (A/S=72/28)	RT	100	-
	10min	100	unchanged
	1hr	100	unchanged
	10hr	100	unchanged
	24hr	100	unchanged

Chemical Resistance (Acid) of HILTEX ALF(A/S=72/28)

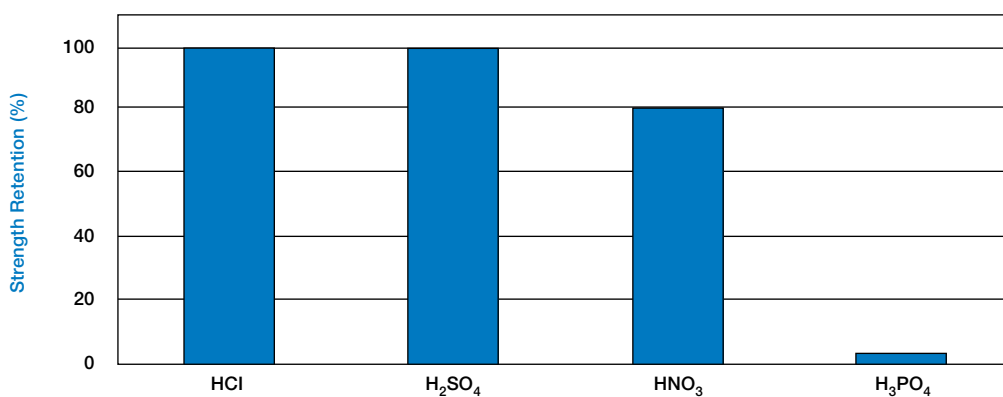
Strong Acid (Room Temperature)

Strength Retention vs Strong Acid
Soak ALF in 10% solution for 24hrs



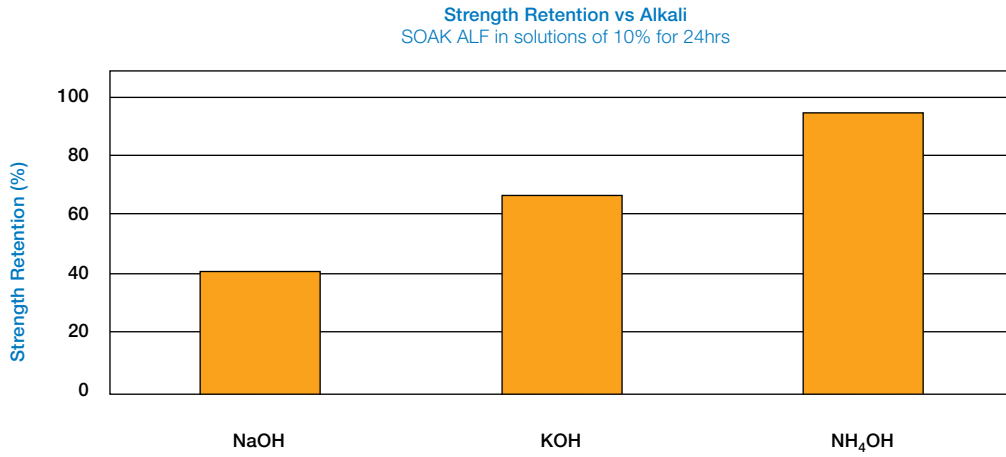
Strong Acid (After exposed at 800 ×10min)

Strength Retention vs Strong Acid
Soak ALF 300°C x 10 min

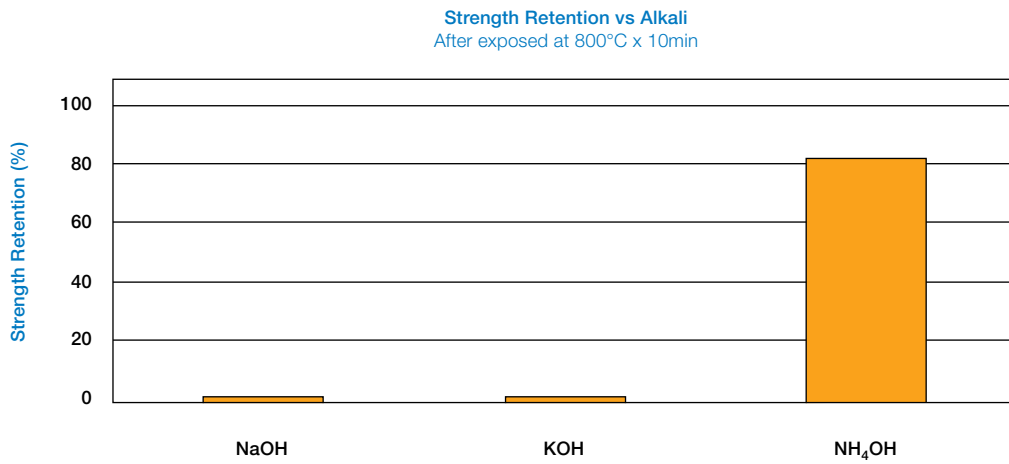


Chemical resistance (Alkali) of HILTEX ALF(A/S=72/28)

1. Alkali(Room temperature)



2. Alkali (After exposed at 800 x10min)



Electrical properties of HILTEX ALF

1. Sample(Woven fabric)

Type name	Weave	Chemical composition (%)		Thread count per inch		Weight (g/m ²)	Thickness (mm)
		Al ₂ O ₃	SiO ₂	Warp	Fill		
3025-T	Twill	72	28	30	25	440	0.35 (0.55)

(): Measured by ASTM method

2. Result

Temperature(°C)	Volume resistivity (Ω cm)	Dielectric constant	Dielectric loss tangent	Dielectric breakdown voltage (KV/mm)
Room temperature	3.60×10^{14}	1.635	0.00202	3.3
100	2.58×10^{15}	1.669	0.00407	—
200	1.51×10^{13}	1.800	0.02004	2.8
600	3.50×10^9	—	—	1.9
1,000	9.05×10^8	—	—	1.5

The electric non-conductance of HILTEX ALF at high temperature

1. Sample(Woven fabric)

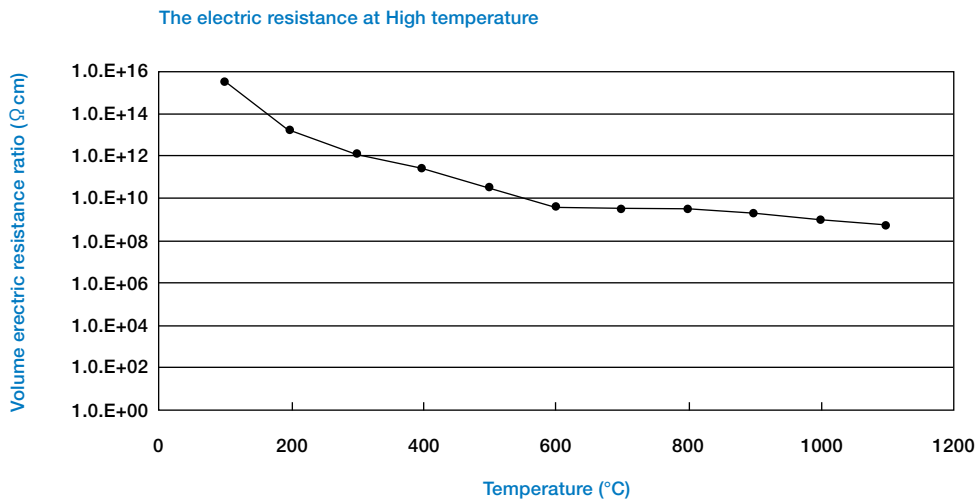
Type name	Weave	Yarn type (g/1,000m)	Thread count per inch		Weight (g/m ²)	Thickness (mm)
			Warp	Fill		
3025-T	Twill	200	30	25	440	0.35 (0.55)

(): Measured by ASTM method.

2. The measuring method

The following data is measured in accordance with "JIS K 6911".

3. Result



Health & Safety Bulletin

HILTEX ALF

Introduction

HILTEX ALF Ceramic Fibers are refractory alumina-silica fibers with diameters 7-10 microns.

They are produced in continuous lengths.

HILTEX ALF Ceramic Fibers are coated with organic sizing which help to textile processing.

HILTEX ALF Ceramic Fibers does not indicate significant health risks under most condition of use.

Under certain conditions, however, HILTEX ALF Ceramic Fibers may cause health effects if not handled properly. The following information is available in Material Safety Data Sheets (MSDS).

Fiber and Dust Inhalation

Although HILTEX ALF is classified as ceramic fibers, they are manufactured in continuous lengths and have diameters (7-10microns) which are not considered to be respirable by humans. Since they are not considered to be respirable, inhalation exposure to HILTEX ALF fibers is not expected to pose a carcinogenic risk to humans. They may, however, cause mechanical irritation of the nose and throat.

In certain operations, HILTEX ALF Ceramic Fibers may break to form a dust, particularly if the sizing has been removed or the fibers have been exposed to high temperatures.

There is currently no specific OSHA Permissible Exposure Limit(PEL) or ACGIH Threshold Limit Value(TLV) for refractory ceramic fibers. The Refractory Ceramic Fiber Coalition (RCFC) has suggested an exposure limit of 0.5 fibers/cc for those fibers <3microns in diameter. The RCFC suggested exposure limit is an organizational number rather than a regulatory number. However, since HILTEX ALF Ceramic fibers are non respirable (fiber diameter of >3 microns), they are not covered by this suggested limit. Instead, HILTEX ALF Ceramic Fibers are covered by the OSHAPELs for “particulates not otherwise regulated” of 15mg/m³ as total particulate and 5mg/m³ as respirable particulate. In addition , these fibers are covered by the ACGIH TLVs for “particulates not otherwise classified” of 10mg/m³ as inhalable(total) particulate and 3mg/m³ as respirable particulate. Both values are 8-hour time –weighted averages. We recommend the ACGH TLVs.

The EU directive 97/69/EC of December 5, 1997 is the European legal base for classification, packaging and labeling of certain man-made vitreous fibers.

Laboratory studies have shown that certain man-made vitreous fibers have carcinogenic effects.

Due to the fact that HILTEX ALF Ceramic Fibers do not meet the critical geometric dimensions for respirable fibers (note R in 97/96/EC).

HILTEX ALF does not have to be classified as dangerous substances according this directive.

Furthermore, HILTEX ALF ceramic fiber diameter 7-10 microns puts them outside the World Health Organization (WHO) definition of respirable. Fibers are defined as respirable by WHO convention if the length is greater than 5 microns and the diameter ratio greater than 3:1.

Local exhaust ventilation and/or use of NIOSH approved dust mist respirators is recommended for operations where fibers or dust may become airborne. If nose or throat irritation occurs, move to fresh air.

Eye and Skin Contact

HILTEX ALF Ceramic Fibers can cause mechanical irritation of the eyes and skin similar to the caused by fiberglass. Safety glasses or goggles, gloves and long sleeved clothing with tight fitting cuffs are recommended to minimize eye and skin contact. Contaminated clothing should be laundered each day.

If eye irritation occurs, flush eyes with water. If skin irritation occurs, wash the affected area with soap and water and change to fresh clothing.

Heat Cleaning /Treatment

HILTEX ALF Ceramic Fibers are coated with organic sizing which are removed at high temperature. HILTEX ALF Ceramic Fibers generates thermal decomposition products which may be hazardous if inhaled at concentrations exceeding their recommended exposure limits. Carbon monoxide is the predominant decomposition product. Trace amount of nitrogen oxides and hydrogen cyanide may also be generated. By controlling carbon monoxide concentrations to the ACGIH Threshold Limit Value of 25 ppm(8hr TWA), other decomposition products should also be adequately controlled. Control of carbon monoxide levels may be most effectively achieved through the use of exhaust ventilation, for example an exhaust enclosure or hood.

The ventilation system should provide a minimum capture velocity of 150ft/min(45.72m/min) and should not be subject to disturbances produced by cross drafts.

After Service Considerations

Analyses of HILTEX ALF Ceramic Fibers, either as manufactured or after use, has shown that neither free silica nor the cristobarite form of silica is present. The silica in the fibers is present in a stable mixture of alumina and silica.

Material Safety Data Sheet

Manufacturers Name Hiltex Semi Products
Add: Handelsweg 37 1525 RG West Knollendam
 phone 31-75-687-1090
 fax 31-75-687-7132
Issue Date: March, 2002
Supersedes Date: August, 2002

1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION

Tradename: 'HILTEX ALF' CONTINUOUS ALUMINASILICATE FIBER

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient name and classification	CAS number	Percentage
ALUMINASILICATE FIBERS	1327-36-2	97.0-99.5
ORGANIC SIZING	-----	0.5-3.0

3. HAZARDS IDENTIFICATION

Critical hazards Not applicable

4. EMERGENCY MEASURES

Eyes Wash with water until foreign matter is removed, but do not rub the eyes.
Skin Wash with cold water or with lukewarm water.
 Thereafter, wash with soap. Consult with medical doctor, if ache or irritation remains.
Inhalation If signs or symptom occur, remove person to fresh air. If not breathing,
 get immediate medical attention.

5. IN CASE OF FIRE MEASURES

ALUMINASILICATE FIBERS	Not applicable. Not combustible.
ORGANIC SIZING	Small amount of smoke and carbon monoxide, and trace amount of nitrogen oxides and hydrogen cyanide. And the other substances are produced upon initial heating. These decomposition products are not expected to exceed exposure limits during recommended use procedures.

6. ACCIDENTAL RELEASE MEASURES

- **Personal Precautions:**
Refer to other sections of this Material Safety Date Sheet for information regarding physical and health hazards, respiratory protection, ventilation, and personal protective equipment.
 - **Method for Cleaning up:**
Sweep carefully and collect the dust. Take due care prevent a spreading or dust.
-

7. HANDLING AND STORAGE

Precaution for Safe Handling

- To prevent the dispersal of ALUMINASILICATE FIBER dust, countermeasures should be enforced, such as setting up an exhaust facility at points of operation within the plant.
 - Respirator should be worn at places where it may be impractical to try to prevent the spread of ceramic fiber dust.
-

- If necessary, protective eyeglasses and gloves should be worn.
- ALUMINASILICATE FIBER dust, which has become attached to the work clothes, should be removed carefully by using a vacuum cleaner or adhesive tape without leading to a dispersal of dust.
- Gargle and wash the hands after work

Precautions for Safe Storage

- Keep container dry

Fire Prevention

- Not applicable

8. EXPOSURE PREVENTION MEASURES

• **Regulatory Concentration**

Mass Concentration: 2.9mg/m³ (zero content of free-silica is applied)
(inhaled dust) Fiber concentration is not fixed.

Referential Standard*: Fiber Concentration Standard: length>5micron,
Dia.<3micron, Aspect ratio>3

Exposure Concentration: 1 fiber/cm³ (TWA)

*U.S. Occupational Safety & Health Administration Standard(OSHA) (1992)

• **Protection**

Respirator:

It is necessary to wear the respirator when it is anticipated that dust concentration in the work environment will exceed the standard. The respirator with filter exchangeable is to be used. There are various approved respirators available on the market, but the type that is most fit for the work environment, with a tight fit to the face and a good filter should be chosen.

Eyeglasses:

Goggles and eyeglasses with a side shield should be used.

Gloves/Work Clothes:

Gloves should be worn. Work clothes should be long sleeve. The clothes should be suited to work activity. There should be no skin exposure.

9. PHYSICAL/CHEMICAL PROPERTIES

Appearance	White and Fiber
Boiling point	not applicable
Melting Point	<1800 degree
Auto flammability	not applicable
Average Fiber Diameter	7-10 microns
True Specific Gravity	2.5-3.5 (Water=1)
Water Solubility	Non soluble in water and organic solvents

10. STABILITY AND REACTIVITY

Has stability, no reactivity

11. HARMFULNESS INFORMATION

(1) Acute effect

Eye contact: Physical irritation.

Skin contact: Itchiness, red spots of temporary nature, but not chronic.

(2) Chronic effect

Dust created during production contains inhalable fiber which, if inhaled over a long period of time, harbors a risk of bringing about respiratory disorders. Currently, however, we know of

no reports that such disorders have occurred for the above reason during the handling of ceramic fiber.

(3) Carcinogenic

HILTEX ALUMINASILICATE FIBERS are considered to be non-respirable and, therefore, unlikely to pose a cancer risk.

Respirable fibers are defined by the World Health Organization as having lengths greater than 5 microns, diameter is less than 3 microns and aspect ratios are greater than 3:1. HILTEX ALF has diameters 7-10 microns and has continuous in length.

12. ECOLOGICAL INFORMATION

Not soluble in water so there is no effect on water organisms.

13. WASTE DISPOSAL

To prevent HILTEX ALUMINASILICATE FIBER dust becoming airborne in the periphery, place the dust in a bag of plastic having a minimum thickness of 0.05mm. Comply with local regulations.

14. TRANSPORT INFORMATION

HILTEX ALUMINASILICATE FIBER poses no problem during transport, but due care must be taken to prevent any possible dispersal of material due to damage on packages.

15. APPLICATION OF LAWS/REGULATIONS

ALUMINASILICATE FIBER is classified as a "mineral" under the "Regulation for Prevention of Dust Impediments" (Dust Regulation).

It is not governed by "Special Chemical Materials Impediment Prevention Regulation (Spechem Reg.); but in case of such operations as the following, the aforementioned "will be applicable:

1. Operations in places where materials are cut, whittled and finished.(see Dust Reg. Chart 1-6)
2. Operations in places where materials are machine-pulverized and sieved.
(see Dust Reg. Chart 1-8)
3. Operations where furnaces are constructed or repaired with the use of refractories, and where ovens or furnaces that use refractories are dismantled or destroyed.(see Dust Reg. Chart 1-19)

It is recommended that the "Guideline for Work and Safety for Glass Fibers and Rock Wool (Ministry of Labor Notification 1 of Jan. 1 .1993) be applied where the necessary arises.

16. OTHER INFORMATIONS

We believe the information on this data sheet is correct to the best of our current knowledge.

However, no warranty is made with respect to its completeness.

The data in Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material.

This Material Safety Data Sheet is followed by Data Sheets, prepared by Environmental Committee of RCF Assn .On 5. Jul. 1995



Corus Research, Development & Technology
Ceramics Research Centre
Microstructure, Crystallography, Thermal Analysis

IJmuiden, 9 oktober 2009
Koolwijk

MCT rapportnr.: N0712
In opdracht van: CRDT PRC CRC RAD
Kostenplaats: 827911
Kosten in uren: 4

Aan: Siebring
Tk: vdLaan
Andersen

Fibre research: **Hiltex Technische Weefsels, ALF 3025-D.**

1. Scope.

In order to determine the security safety recommendations in respect to usage of mineral materials we have tested these materials on users safety. The supplied samples have been tested to avoid particles. The scope of the test is structure, diameter, diameter/length ratio and chemical composition. The offered Hiltex ALF 3025-D is a non respirable mullite type product. The question is whether the product changes after heat exposure (crystal form) or creating a problem for splitting in length direction. In order to determine these figures we have tested ALF 3025-D for 24 hours at a temperature of 1400 °C, after this exposure a part of the tested sample has been transformed into dust.

2. Sample information.

Sample VZL N0712-1; ALF 3025-D 70/30 supplied by Hiltex
Sample VZL N0712-2; ALF 3025-D 80/20 supplied by Hiltex

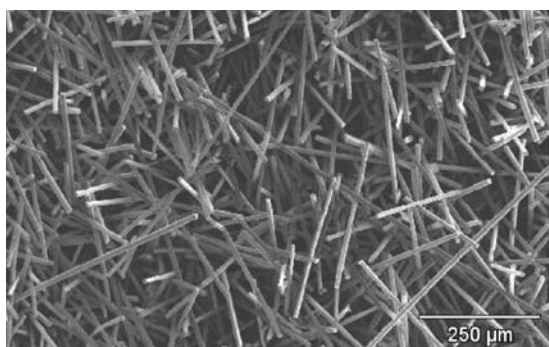
3. Results.

Sample VZL N0706-1; ALF 3025-D, The fabric consist out of Ceramic fabric, type mullite and Corund (no Crystalline silica found). The fibres are crystalline , the chemical composition is in Table 1. The sample does not contain fibres of a diameter < 3µm or a length > 5µm (NON respirable fibres). It is a ceramic yarn with a diameter between. 6 – 8 µm.

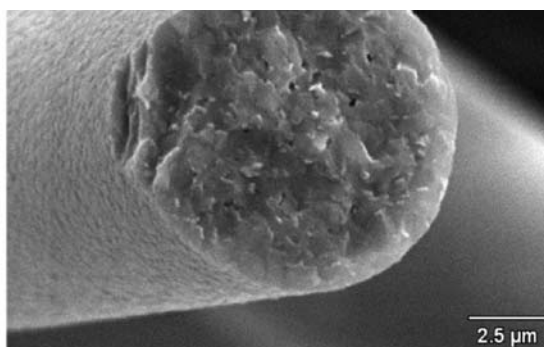
Table 1: Chemical composition ALF 3025-D (weight-%).

Monster	Na2O	MgO	SiO2	Al2O3	CaO	TiO2	FeO	type
AFL 3025-D			28	72				mullite
AFL 3025-D			20	80				corund

Sample VZL N0706-2; ALF 3025-D, the dust is ceramic fibres, from a non splitting type, a example is on pictures 1 en 2. The specimen does not contain fibres of a diameter < 3µm or a length > 5µm (non respirable fibres). What has been found is a non splitting fibre with a diameter of 6 – 8 µm.



Picture 1: broken fibres of ALF 3025-D



Picture 2: detail fibre, broken after exposure

Crystalline ALF 3025-D of Hiltex after exposure at 1400 °C , containst **non splitting non** respirable ceramic fibres.

3. Conclusions

- * Sample VZL N0712-1/2.
- * Crystalline.
- * non respirable fibre.
- * non splitting ceramic fibre.
- * Coruscode B1B¹

¹IJmuiden online; IJmuiden; Veiligheid, Gezondheid, Milieu; Regelingen Veiligheid; Voorschriften..; 304 asbest.