

General information

Designation

Asbestos, blue, fiber

Typical uses

Asbestos-cement products - flat sheets, tiles, pipes and guttering, reinforcing plastic materials for structural applications, battery casings, brake and clutch linings (when imbedded in phenolic resins). ablating composites.

Composition overview

Compositional summary

49-69%SiO₂/13-21.7%Fe₂O₃/3-25%Other Oxide/0-15.7%MgO/0-2.4%CaO/0-1.2%Al₂O₃
[Na₂(Fe²⁺,Mg)₃Fe₂₃+Si₈O₂₂(OH)₂]

Form	Fiber
Material family	Ceramic (non-technical)
Base material	Oxide

Microstructure

Grain size: 0.04-0.09µm

Composition detail (metals, ceramics and glasses)

Al ₂ O ₃ (alumina)	0	-	1,2	%
CaO (calcia)	0	-	2,4	%
Fe ₂ O ₃ (ferric oxide)	13	-	21,7	%
MgO (magnesia)	0	-	15,7	%
SiO ₂ (silica)	49	-	69	%
Other oxide	3	-	25	%

Price

Price	* 1,66	-	2,07	EUR/kg
Price per unit volume	* 5,48e3	-	7,12e3	EUR/m ³

Physical properties

Density	3,3e3	-	3,44e3	kg/m ³
Porosity (closed)	* 0,01	-	0,05	%
Porosity (open)	* 0,01	-	0,03	%

Mechanical properties

Young's modulus	185	-	195	GPa
Specific stiffness	54,5	-	58,3	MN.m/kg
Yield strength (elastic limit)	* 3,33e3	-	3,68e3	MPa
Tensile strength	3,33e3	-	3,68e3	MPa
Specific strength	* 983	-	1,1e3	kN.m/kg
Elongation	* 1,71	-	1,99	% strain
Flexural modulus	* 185	-	195	GPa
Shear modulus	* 52	-	57	GPa

Bulk modulus	* 130	-	145	GPa
Poisson's ratio	* 0,25	-	0,3	
Shape factor	1			
Hardness - Vickers	160	-	250	HV
Elastic stored energy (springs)	* 2,91e4	-	3,56e4	kJ/m^3
Fatigue strength at 10^7 cycles	* 2,83e3	-	3,3e3	MPa

Impact & fracture properties

Fracture toughness	* 3	-	6	MPa.m^0.5
Toughness (G)	* 0,0518	-	0,173	kJ/m^2

Thermal properties

Melting point	1,48e3	-	1,52e3	°C
Maximum service temperature	604	-	696	°C
Minimum service temperature	-273			°C
Thermal conductivity	* 2	-	6	W/m.°C
Specific heat capacity	795	-	865	J/kg.°C
Thermal expansion coefficient	* 3,5	-	5	µstrain/°C
Thermal shock resistance	* 3,66e3	-	5,3e3	°C
Thermal distortion resistance	* 0,471	-	1,46	MW/m
Latent heat of fusion	* 830	-	930	kJ/kg

Electrical properties

Electrical resistivity	* 1e22	-	1e24	µohm.cm
Electrical conductivity	* 1,72e-22	-	1,72e-20	%IACS
Dielectric constant (relative permittivity)	* 8	-	10	
Dissipation factor (dielectric loss tangent)	* 0,003	-	0,005	
Dielectric strength (dielectric breakdown)	* 5	-	10	MV/m

Magnetic properties

Magnetic type	Non-magnetic
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Optical, aesthetic and acoustic properties

Transparency	Opaque			
Acoustic velocity	7,38e3	-	7,64e3	m/s
Mechanical loss coefficient (tan delta)	* 1e-4	-	3e-4	

Critical materials risk

Contains >5wt% critical elements?	No
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Durability

Water (fresh)	Excellent
Water (salt)	Excellent
Weak acids	Excellent
Strong acids	Acceptable
Weak alkalis	Excellent

Strong alkalis	Acceptable	
Organic solvents	Excellent	
Oxidation at 500C	Acceptable	
UV radiation (sunlight)	Excellent	
Halogens	Acceptable	
Metals	Acceptable	
Flammability	Non-flammable	
Oxygen index	100	%

Primary production energy, CO2 and water

Embodied energy, primary production (virgin grade)	1,02	-	1,12	MJ/kg
Sources				
1.07 MJ/kg (Ecoinvent v3.7.1)				
Embodied energy, primary production (typical grade)	1	-	1,12	MJ/kg
CO2 footprint, primary production (virgin grade)	0,0703	-	0,0777	kg/kg
Sources				
0.074 kg/kg (Ecoinvent v3.7.1)				
CO2 footprint, primary production (typical grade)	0,0703	-	0,0777	kg/kg
Water usage	* 37,7	-	41,7	l/kg

Recycling and end of life

Recycle	✗
Downcycle	✓
Combust for energy recovery	✗
Landfill	✓
Biodegrade	✗

Notes

Warning

All forms of asbestos decompose when heated in the range 875 - 1275K, giving pyroxenes and silicas. Strength values are sensitive to fiber length - values quoted are for 4mm x 15um diameter fibers.

Other notes

Also known as Riebeckite. Forms a superior bond to polyester resins than amphibole asbestos'. Polymers reinforced using asbestos have generally superior properties to GFRP.

Links

[ProcessUniverse](#)
[Reference](#)
[Shape](#)