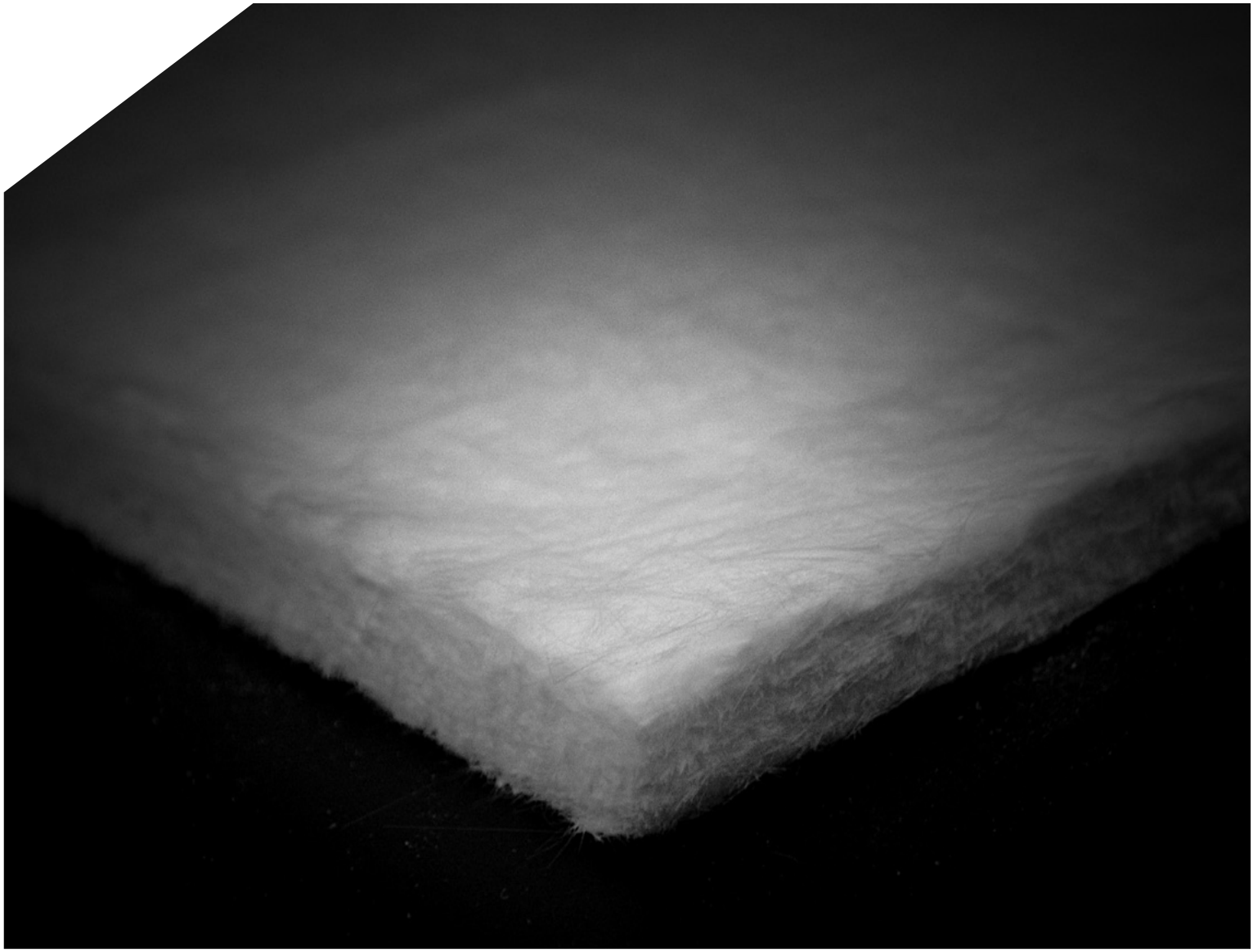
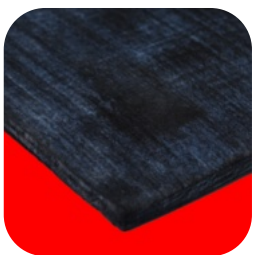
Wedge Aerogel

High Performance WedGel Insulation

Blanket | Panel | Pad | Paper | Paint | Powder | Spray








Wedge Heat & Sound Insulation Systems

Improved solutions to heat problems are constantly required in most applications and processes starting from (-) 200 °C to 1750 °C to improve operational performance and durability of equipment, reduce heat loss, save energy, save space, and protect environment.

Finding heat insulation system with highest insulation performance (lowest thermal conductivity), high mechanical strength, high service temperature, easiest application, long lasting, and lowest cost is almost impossible. However, thanks to the modern insulation technologies and latest developments in combining wide range of technical properties making it available a wide range of insulation materials & systems to achieve optimized high performance at low cost and long lasting insulation systems at extremely low maintenance cost.

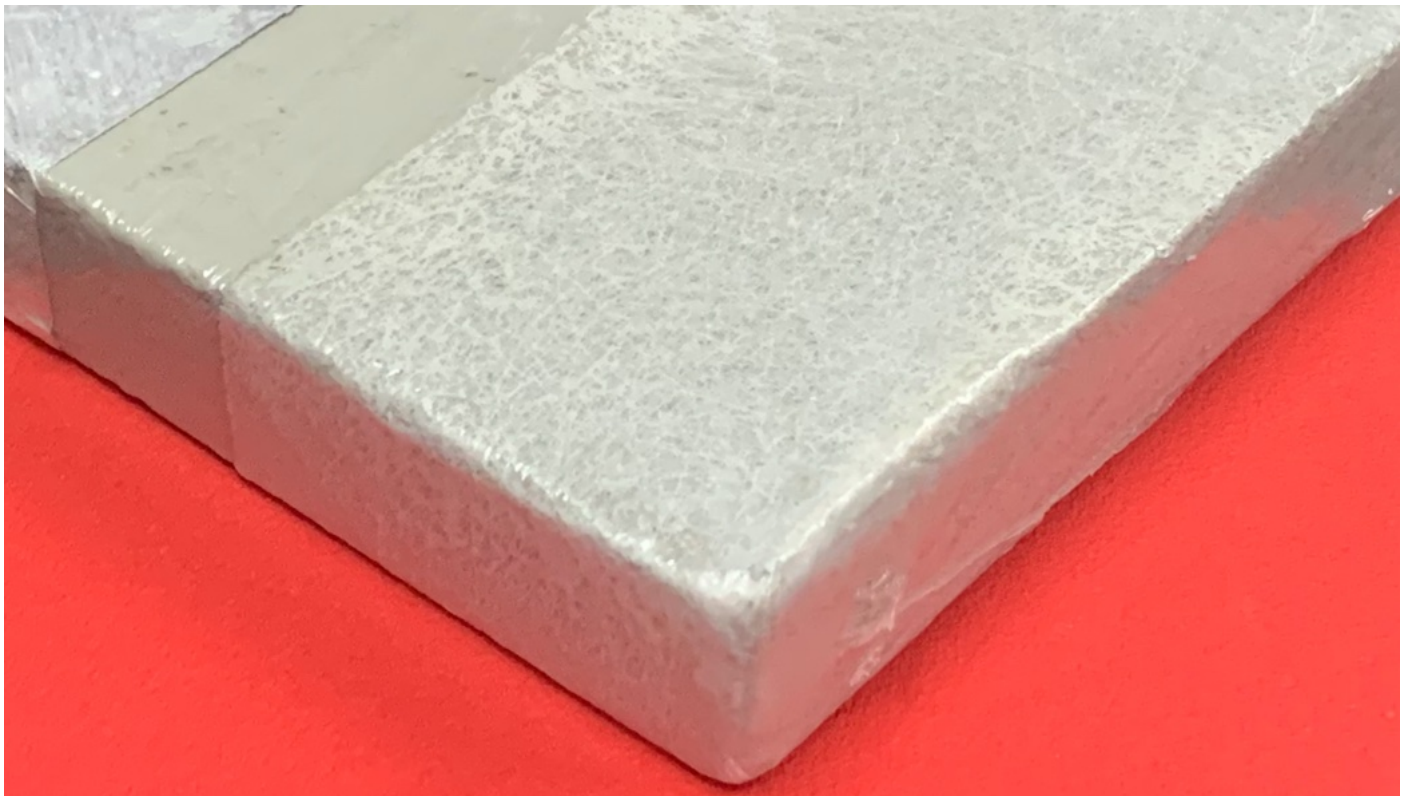
Heat insulating materials usually have a total porosity of at least 45%, in practice mostly from 60 to 90%, and in extreme cases up to 99%. Besides low thermal conductivity, high porosity causes reduced mechanical strength, high gas permeability and low corrosion resistance. The thermal conductivity not only depends on the total porosity of the material, but also on the pore size and shape, the structure composition and the mineralogical composition.

Depending on temperature, the factors responsible for the flow of heat – solid state conduction, convection and radiation – vary in influence. Maximum pore diameters of < 1 mm are necessary. Micro -porous insulating materials with pores < 0.1 µm have the lowest thermal conductivity.

Wedge manufactures and offers wide range of Insulation solutions designed in-house, manufactured with high quality raw materials, and fabricated to highest precision.

Wedge Insulation systems satisfy the demand for optimum planning, thermal profiles, ready to use shapes, lower thickness, easy installation, high insulation performance, long life, and lower maintenance cost. Our insulation materials are most suitable for all types of surfaces straight and cylindrical.

Our wide range of insulation products include: Microsilica, Fumed Silica, Nano-porous, Microporous, Millboards, Magnesium Silicate, Calcium Silicate, Perlite, Vermiculite, Refractory Fibre Cement, Ceramic Fibre, Glass Wool, Slag Wool, Foam Glass, WedGel Aerogel, Vacuum Insulation.

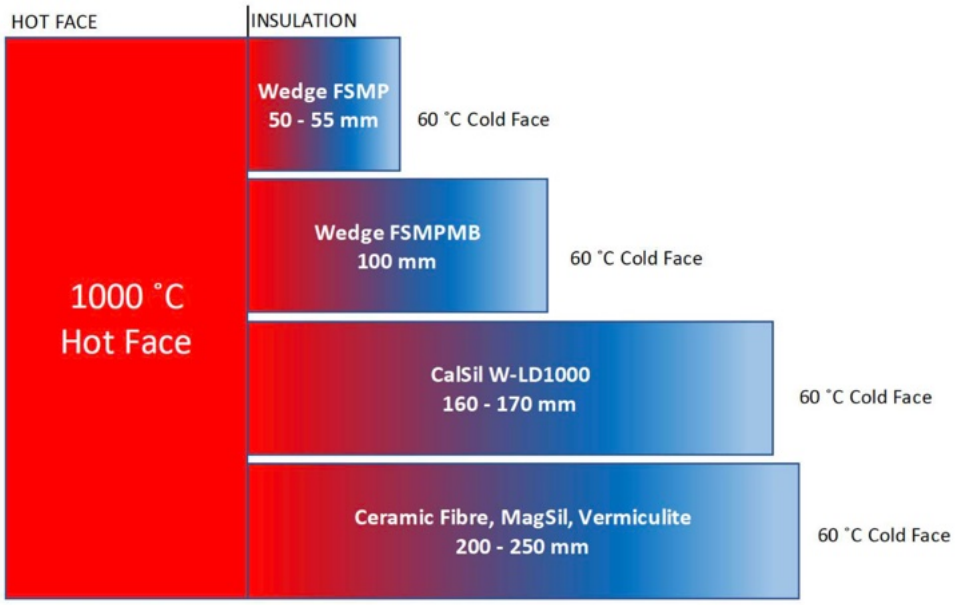


High Performance Thermal Insulation Systems

Insulation is a property of any material that explains the resistance to transfer or transmit any form of energy it could be sound, heat, electricity, fire, cooling, vibrations. In general term Insulation is used to describe material that creates barriers for transmission of electricity, heat, moisture, shock or sound.

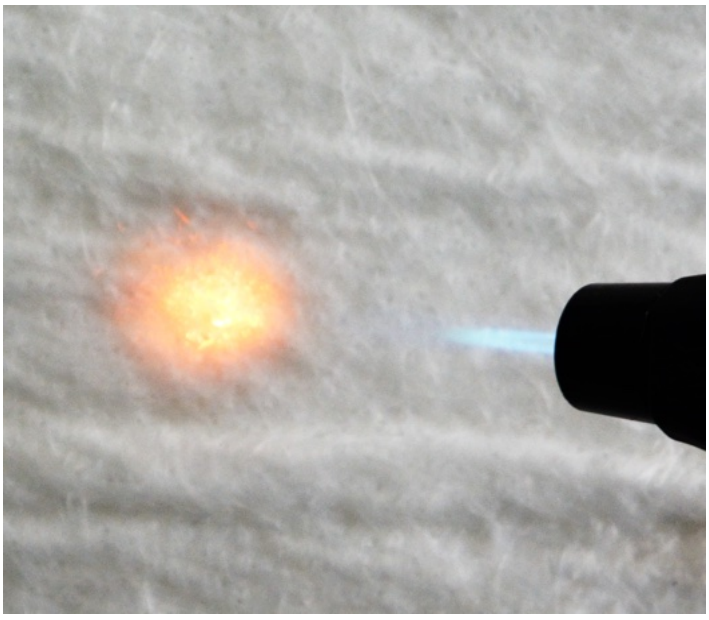
Creating Barrier to Thermal Heat Losses

Thermal insulation of any material (organic or inorganic) is the resistance to heat transfer or transmission. To understand insulation materials we need to understand the physics of heat transfer. Heat transfer can occur through conduction (solid & gaseous), convection and radiation. Usually the overall heat transfer comes from a combined effect of all of them. The driving force in this process is the temperature difference. In furnaces and plants with low mechanical load and without corrosion stress, a design with lightweight heat insulating materials has almost completely eliminated heavy designs with dense, refractory materials.



Wedge Insulation Products - Most Effective Low Cost Insulation System

Heat insulating materials are products for the refractory lining of thermal industrial plants with the objective of reducing heat losses. Here the low thermal conductivity and the thermal capacity of air is used. Heat insulating materials usually have a total porosity of at least 45%, in practice mostly from 60 to 90%, and in extreme cases up to 99%. Besides low thermal conductivity, high porosity causes reduced mechanical strength, high gas permeability and low corrosion resistance.

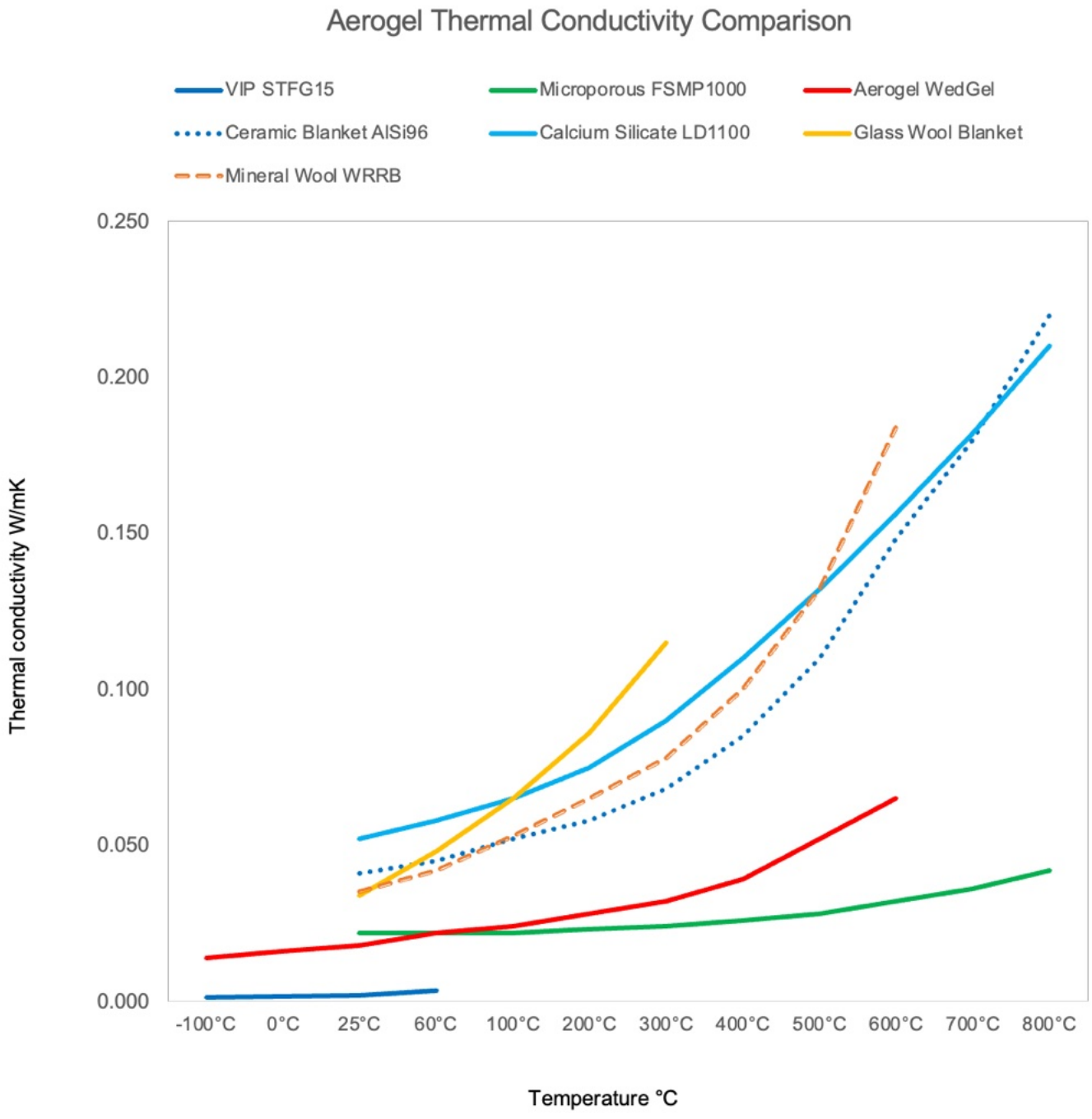


The thermal conductivity not only depends on the total porosity of the material, but also on the pore size and shape, the structure composition and the mineralogical composition. Depending on temperature, the factors responsible for the flow of heat solid state conduction, convection and radiation vary in influence. Maximum pore diameters of < 1 mm are necessary.

Wedge Micro Silica WedGel Aerogel Microporous FSMP insulating materials with pores < 0.1 µm have the lowest thermal conductivity. The thermal shock resistance of lightweight construction materials has a large influence on applications. High temperature wool products usually resist severe thermal shocks. Other lightweight construction materials are sensitive to thermal shock. The term “heat insulating bricks” covers those heat insulating materials which are applied up to 1000°C and which are often mistakenly referred to as rear insulation materials. These products are manufactured on the basis of naturally occurring lightweight raw materials. They are assigned to the group of lightweight refractory bricks which are made out of refractory raw materials.

WedGel | Aerogel Insulation Thermal Conductivity

Aerogels are produced by extracting the liquid component of a gel through supercritical drying. This allows the liquid to be slowly drawn off without causing the solid matrix in the gel to collapse from capillary action, as would happen with conventional evaporation. ASTM C168 defines an Aerogel as – “A homogenous, low density solid phase material derived from a gel, in which the liquid component of the gel has been replaced with a gas. The resulting material has a porous structure with an average pore size below the mean free path of air molecules at standard atmospheric pressure and temperature”.



Aerogel is a unique material known for its extremely low density and high thermal insulation properties. It is often referred to as "frozen smoke" or "solid air" due to its translucent appearance and lightweight nature. Aerogel is composed of a gel-like substance, typically silica, which undergoes a process called supercritical drying. During this process, the liquid in the gel is replaced with gas without causing the material to collapse or shrink. The result is a solid material that is mostly made up of air, with a porous and interconnected structure. Due to its low density, Aerogel is considered one of the lightest solid materials in existence. It is highly porous, with a large surface area per unit volume, giving it exceptional insulating properties. WedGel Aerogel has an extremely low thermal conductivity, which means it is a poor conductor of heat. This property allows it to effectively prevent the transfer of heat, making it a popular choice for thermal insulation in various applications.

WedGel | Aerogel Insulation Materials Selection

Cold Chain & Cryogenic Application

Quality	WedGel 125B	WedGel 125A	WedGel 150AL	WedGel 200HP	WedGel 125LD	WedGel VIP
Type	Blanket	Blanket	Blanket	Blanket	Blanket	Panel
Temperature ºC	-180 to 125	-200 to 125	-195 to 150	-200 to 200	-200 to 125	-100 to 80
Thickness, mm	5 to 20	10	5 to 20	5 to 10	8	20 to 50
Density, Kg/m3	185	160 ± 30	160 - 200	160	70	200 ± 30
Thermal Conductivity						
W/m.K at -73°C	0.018	0.016	0.017	0.015	NA	0.002
W/m.K at -17°C	0.020	0.017	0.018	0.016	0.019	0.004
W/m.K at 24°C	0.021	0.018	0.021	0.017	0.023	0.005
W/m.K at 100°C	0.023	0.021	NA	0.019	0.032	NA
Cost	L1	L2	L3	L4	L5	L8
Covering Options	NA	Silica Cloth	Aluminium Foil	All Type	NA	Aluminium

High Temperature Application

Quality	WedGel ECO	WedGel WAG650	WedGel WAG400	WedGel 650HP
Temperature ºC	650	-50 to 650	-50 to 400	-10 to 650
Thickness, mm	3 to 20	1 to 50	3 to 15	5 to 20
Density, Kg/m3	170 ± 20	200 ± 40	180	200
Thermal Conductivity				
W/m.K at 25°C	0.029	0.018	0.018	NA
W/m.K at 37.8°C	NA	0.022	0.022	NA
W/m.K at 100°C	0.039	0.023	0.023	0.024
W/m.K at 200°C	0.049	0.028	0.026	0.028
W/m.K at 300°C	0.061	0.035	0.035	0.033
W/m.K at 400°C	NA	0.047	NA	0.040
W/m.K at 500°C	NA	0.058	NA	0.049
W/m.K at 600°C	NA	0.068	NA	0.062
Cost	L1	L2	L3	L4
Coverings Options	All Type	All Type	Silica, Aluminium	NA

EV Batteries and Building Insulation & Fire Protection

Quality	WedGel BL20	WedGel BL50	WedGel 350EV	WedGel WAG 650EV
Application	Building Cold Insulation	Building Heat Insulation	Batteries Insulation	Batteries Insulation
Service Temperature, ºC	-170 to 100	25 to 1400	-200 to 400	50 to 1200
Thickness, mm	5, 10	10	0.2 - 3 mm	0.7 - 10
Density Kg/m3	150	180	300	160 +/- 30
Thermal Conductivity				
W/m.K at 25°C	0.021	0.021	0.019	0.021
W/m.K at 37.8°C	0.022	0.022	0.022	0.022
W/m.K at 100°C	NA	0.024	0.024	0.025
W/m.K at 200°C	NA	0.029	0.027	0.035
W/m.K at 300°C	NA	0.036	0.032	0.048
W/m.K at 500°C	NA	NA	NA	0.065
Cost	L2	L1	L2	L1
Coverings Options	NA	NA	Aluminium, PET	Silica

Aerogel Powder

Quality	Wedge WAP20	Wedge WAP40	Wedge WAPM19	Wedge AG Bead
Thermal Conductivity, W/m·K. 25°C	0.016 - 0.018	0.018	0.019	0.016 - 0.019
Specific Surface Area, m2/g	600 - 800	800 - 960	600 - 800	300 - 500
Bulk Density, kg/m3	20 - 100	40 - 120	60	100 - 200

Aerogel Paste, Paint, Coatings

Quality	Solid Content %	WFT/Coat, µm	DFT/Coat, µm	Curing	Curing at NTP (20~30oC)
Wedge WJ120	32 - 35	500	175	30 minute / 0.5 mm, Wet at 50-85 °C	3 hrs/.5mm WFT

WedGel | Aerogel Insulation Features & Benefits

WedGel Aerogel insulation is a type of thermal insulation material that utilizes Aerogel to provide excellent insulation properties. WedGel Aerogel is well-known for its extremely low thermal conductivity, making it one of the most effective insulating materials available. WedGel Aerogel insulation is typically used in applications where high-performance insulation is required, such as in buildings, industrial processes, and transportation systems. It offers superior thermal insulation compared to traditional insulation materials like fiberglass, foam, or mineral wool. The use of WedGel Aerogel insulation can significantly reduce heat transfer through walls, roofs, pipes, and other surfaces, resulting in improved energy efficiency and reduced heating or cooling costs. Its high insulating capacity allows for thinner insulation layers while achieving the same or better insulation performance, which can be beneficial in space-constrained environments.

WedGel Aerogel insulation comes in various forms, including blankets, panels, powders, and coatings. These forms can be tailored to suit specific applications and installation requirements. The flexibility of WedGel Aerogel insulation allows it to be used in both retrofitting existing structures and in new construction projects. One of the advantages of WedGel Aerogel insulation is its hydrophobic nature, meaning it repels water. This property prevents moisture absorption and helps maintain the insulation's performance over time. WedGel Aerogel insulation is also fire-resistant and can provide an additional level of safety in buildings and other structures. However, it's worth noting that WedGel Aerogel insulation can be more expensive compared to traditional insulation materials. The cost can vary depending on factors such as the specific type of WedGel Aerogel used, the form it comes in, and the thickness or coverage required. Overall, WedGel Aerogel insulation offers exceptional thermal insulation performance, energy efficiency, and other desirable properties. Its use can contribute to reducing energy consumption, improving comfort, and enhancing the overall sustainability of buildings and various industrial processes.

WedGel Aerogel insulation is a highly effective type of insulation that utilizes WedGel Aerogel, a lightweight and porous material, to provide superior thermal insulation properties. WedGel Aerogel insulation is known for its exceptional thermal resistance, low thermal conductivity, and high insulation efficiency. WedGel Aerogel is made by removing the liquid component from a gel through a process called supercritical drying, leaving behind a solid material that is mostly composed of air. This unique structure gives WedGel Aerogel its remarkable insulating properties. It has an extremely low density, which makes it lightweight, and its porous structure traps air molecules, hindering the transfer of heat energy.

Key benefits of WedGel Aerogel insulation include:

- **Excellent thermal insulation:** WedGel Aerogel insulation has an incredibly low thermal conductivity, often up to 2-4 times lower than traditional insulation materials like fiberglass or foam. This means it can effectively reduce heat transfer and minimize energy losses.
- **Thin and lightweight:** WedGel Aerogel insulation can provide equivalent or better insulation performance compared to other materials but at a fraction of the thickness. It allows for thinner insulation profiles, which can be advantageous in applications where space is limited or weight reduction is desired.
- **Hydrophobic properties:** WedGel Aerogel is naturally resistant to moisture, preventing water absorption and maintaining its insulation performance even in damp or humid environments.
- **Fire resistance:** WedGel Aerogel insulation is inherently fire-resistant, making it a safer choice for insulation applications. It can help slow down the spread of flames and provide additional protection in case of fire.

WedGel | Technical Data Sheet

Cold & Cryogenic Aerogel Insulation | ASTM C1728 Type 1, Grade 1B

Quality ASTM C1728	WedGel 125A	WedGel 125LD	WedGel 125B	WedGel 150AL	WedGel 200	WedGel 200HP	WedGel VIP
Service Temperature, ºC ASTM C411, C447	-200 +125	-200 +125	-180 +125	-195 +150	-200 +200	-200 +200	-100 +80
Colour	White	White	Grey	White	Grey	White	Silver
Thickness, mm	10	8 - 25	5 - 20	5 - 20	10 - 20	5, 10	20 - 50
Short Term Temperature Resistance, ºC	1000	300	650	1200	400	1000	1000
Density, ASTM C303, kg/m3	160 ± 30	70	185	160 - 200	170	160	200 ± 30
Compression Strength 10%, Kpa, ASTM C165	60	60	35	60	60	35	
Thermal Conductivity, ASTM C177							
W/m.K at -129°C	0.014	0.013	0.015	0.015	NA	0.014	NA
W/m.K at -73°C	0.016	NA	0.018	0.017	NA	0.015	0.002
W/m.K at -17°C	0.017	0.019	0.020	0.018	NA	0.016	0.004
W/m.K at 24°C	0.018	0.023	0.021	0.021	NA	0.017	0.005
W/m.K at 25°C	0.019	NA	NA	NA	0.018	NA	NA
W/m.K at 37.8°C	NA	0.025	0.022	NA	0.021	0.018	NA
W/m.K at 93.3°C	NA	0.032	0.023	NA	0.022	0.019	NA
W/m.K at 100°C	0.021	0.032	0.023	NA	0.022	0.019	NA
Hydrophobicity %	99	99	99	99	99	99	100
Stress Corrosion, ASTM C795	Pass	Pass	Pass	Pass	Pass	Pass	NA
Corrosiveness of steel, ASTM C1617, ppm CL	<5	<5	<5	<5	<5	<5	NA
Flame Spread Index ASTM E84, FSI	≤ 25	≤ 25	≤ 25	≤ 25	≤ 25	≤ 25	NA
Smoke Developed Index ASTM E84 SDI	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50	NA
Classification, Fire Proofing	A	A	A	A	A	A	NA
Linear Shrinkage 24h, ASTM C356, max %	<2	<2	<2	<2	<2	<2	NA
Water vapour sorption ASTM C1104, max %	<3	<5	<5	<5	<5	<5	NA

High Temperature Aerogel Insulation | ASTM C1728 Type III Grade 1A

Quality ASTM C1728	WedGel WAG 400	WedGel WAG 650	WedGel 650HP	WedGel ECO
Service Temperature ASTM C411/C447, ºC	-50 to 400	-50 to 650	-10 to 650	650
Colour	White / Grey	Light Brown / White	Grey	Light Grey
Thickness, mm	3 - 20	3 - 50	5 - 20	5 - 20
Short Term Temperature Resistance, ºC	1000	1400	1400	1200
Density ASTM C303, kg/m3	180	200 ± 40	200	170 ± 20
Compression Strength, ASTM C165; at 10%, Kpa	60	80	35	20
Thermal Conductivity, ASTM C177				
W/m.K at 25°C	0.018	0.018	NA	0.029
W/m.K at 37.8°C	0.022	0.022	NA	NA
W/m.K at 93.3°C	NA	0.023	NA	NA
W/m.K at 100°C	0.023	0.023	0.024	0.039
W/m.K at 200°C	0.026	0.028	0.028	0.049
W/m.K at 300°C	0.035	0.035	0.033	0.061
W/m.K at 400°C	NA	0.047	0.040	NA
W/m.K at 500°C	NA	0.058	0.049	NA
W/m.K at 600°C	NA	0.068	0.062	NA
W/m.K at 650°C	NA	NA	0.069	NA
Hydrophobicity GB/T 10299-2011 %	99	99	99	99
Flexibility ASTM C1101	Flexible	Flexible	Flexible	Flexible
Complies with ROHS regulation	Complies	Complies	Complies	Complies
Size Tolerances, ASTM C1728	Pass	Pass	Pass	Pass
Stress Corrosion Cracking ASTM C795	Pass	Pass	Pass	Pass
Corrosiveness of Steel ASTM C1617	<5 ppm CL	<5 ppm CL	<5 ppm CL	<5 ppm CL
Reaction to fire, GB/T8624-2012, EN 13501-1	Non-combustible	Non-combustible	Non-combustible	Non-combustible
Flame Spread Index ASTM E84, FSI	≤ 5	0	≤ 5	0
Smoke Developed Index ASTM E84, SDI	≤ 10	0	≤ 10	0
Classification, Fire Proofing GB/T 8642-2012	A	A1		A
Linear shrinkage for 24h max Temp. ASTM C356	<2%	<2%	<2%	<2%
Water absorption by immersion ASTM C1763	<5%	<5%	<5%	<5%
Vibration Loss Ratio, GB/T 34336-2017, %	<1	<1	<1	<1
Water vapour sorption by weight ASTM C1104	≤ 5%	≤ 5%	≤ 5%	≤ 5%
Coverings Options	Aluminium Foil / PE / Silica Cloth	Aluminium Foil / PE / Silica Cloth	Silica Cloth	Aluminium Foil / PE / Silica Cloth

WedGel BL20, BL50 | Aerogel Insulation for Home and Buildings

WedGel Aerogel is a highly effective material for home insulation due to its exceptional thermal insulation properties. It can be used in various forms, such as WedGel Aerogel blankets, panels, or coatings, to provide insulation in residential buildings. WedGel Aerogel is renowned for its extremely low thermal conductivity, which is one of its key properties that makes it an excellent insulating material. The thermal conductivity of WedGel Aerogel is typically in the range of 0.015 to 0.05 W/(m·K) at room temperature. It helps to minimize heat loss or gain, improve energy efficiency, and enhance thermal comfort in different environments.

Features and Benefits

- **Superior Thermal Insulation:** WedGel Aerogel has one of the lowest thermal conductivities of any known solid material. It significantly reduces heat transfer by conduction, convection, and radiation, making it highly efficient at insulating homes. WedGel Aerogel minimizes heat loss during the winter and reduce heat gain during the summer, leading to energy savings and improved comfort.
- **Thin Insulation Profile:** WedGel Aerogel offers high thermal resistance with a relatively thin layer. This is advantageous as it allows for effective insulation without adding excessive thickness to walls or ceilings. It maximizes interior space while still achieving excellent insulation performance.
- **Moisture Resistance:** Many WedGel Aerogel insulation products are hydrophobic, meaning they repel water and resist moisture absorption. This property helps prevent moisture-related issues such as mold growth, rot, or degradation of the insulation material. WedGel Aerogel insulation maintains its thermal performance even in humid or wet environments.
- **Fire Resistance:** WedGel Aerogel insulation offers good fire resistance. Some WedGel Aerogel products are designed to be non-combustible or have high resistance to flames and heat. This can enhance the safety of homes and provide additional fire protection.
- **Versatility:** WedGel Aerogel insulation can be used in various areas of the home, including walls, roofs, floors, and attics. It can be installed during construction or retrofitted into existing homes. It is compatible with different construction materials and can adapt to various architectural designs.
- **Energy Efficiency:** By providing effective thermal insulation, WedGel Aerogel helps improve the energy efficiency of homes. It reduces the need for heating and cooling, resulting in lower energy consumption and reduced utility costs.

Quality ASTM C1728		WedGel BL20	WedGel BL50
Application		Building Cold Insulation	Building Heat & Fire Insulation
Service temperature, ASTM C411/C447		-170 to 100	25 to 1200
Colour		Grey / White	White
Thickness, mm		5, 10, 25, 50	10, 20, 25, 30, 50
Short term Temperature Resistance, ºC		1000	1400
Density (kg/m3) ASTM C303		150	180
Compression Strength, ASTM C165; at 10%, Kpa		80	37
Thermal conductivity, W/m.K, ASTM C177, GB/T10295/4-2008			
	25°C	0.021	0.021
	37.8°C	0.022	0.022
	100°C	0.023	0.024
	200°C	NA	0.029
	300°C	NA	0.036
	400°C	NA	NA
Hydrophobicity GB/T 10299-2011 %		99	99
Complies with ROHS regulation		Complies	Complies
Stress Corrosion Cracking, Tested according to ASTM C692		Pass	Pass
Reaction to fire, ISO 1182, GB/T8624-2012, EN 13501-1		Non-combustible	Non-combustible
Flame spread index (ASTM E84), max FSI		≤ 25	≤ 25
Smoke developed index (ASTM E84) , max ASTM E84 SDI		≤ 50	≤ 50
Classification, Fire Proofing GB/T 8642-2012		A1	A
Water absorption by immersion, max % by weight, ASTM C1763		<5%	<5%

Note: When considering WedGel Aerogel insulation for home use, it's important to consult with insulation professionals or contractors who are knowledgeable about WedGel Aerogel products and their installation.

To put this into perspective, consider that the thermal conductivity of air is around 0.024 W/(m·K), while common insulation materials like fiberglass and mineral wool have thermal conductivities ranging from 0.03 to 0.04 W/(m·K). The low thermal conductivity of WedGel Aerogel is primarily due to its unique nanostructured framework, which consists of a highly porous network of interconnected nanoparticles. This porous structure limits the movement of air molecules and reduces heat transfer through conduction and convection. The exceptional thermal insulation capability of WedGel Aerogel makes it highly desirable for various applications, including home insulation, industrial insulation, cryogenic insulation, and thermal protection in aerospace technologies.

WedGel | Aerogel Insulation Pad for EV Batteries

WedGel Aerogel insulation can be utilized in electric vehicle (EV) batteries to improve their thermal management and performance. EV batteries generate heat during operation, especially during charging and discharging cycles. Effective thermal management is crucial for maintaining battery performance, extending battery life, and ensuring safety. Overall, WedGel Aerogel insulation can contribute to enhanced thermal management, improved energy efficiency, and increased safety in EV batteries, ultimately helping to optimize battery performance and prolong battery life.

Features and Benefits

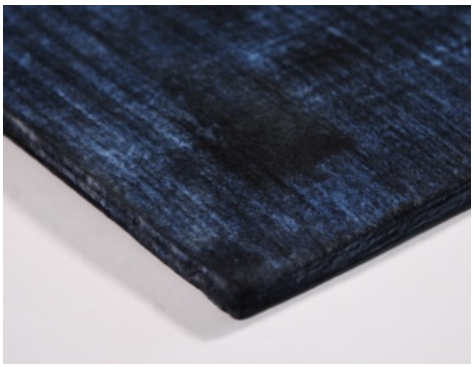
- **Heat Dissipation:** WedGel Aerogel can be applied as a thermal barrier within the battery pack, helping to dissipate heat and maintain optimal operating temperatures. By reducing heat transfer to surrounding components, WedGel Aerogel insulation can prevent overheating and improve battery efficiency.
- **Temperature Regulation:** WedGel Aerogel helps in maintaining more stable and uniform temperatures within the battery pack. By reducing heat loss or gain, it minimizes temperature fluctuations that can negatively impact battery performance and longevity.
- **Energy Efficiency:** Efficient thermal management through WedGel Aerogel can enhance the overall energy efficiency of the battery system. By keeping the batteries within an optimal temperature range, the system can deliver power more effectively, resulting in improved energy utilization & extended driving range.
- **Safety Enhancement:** Proper thermal management is critical for battery safety. WedGel Aerogel insulation can act as a thermal barrier, reducing the risk of thermal runaway or overheating in the event of a battery fault. It can provide an additional layer of protection and help maintain the structural integrity of the battery pack.
- **Space Optimization:** WedGel Aerogel's high insulating capacity allows for thinner insulation layers. This can be advantageous in EV battery design, as it helps optimize the use of limited space within the battery pack, leaving more room for battery cells and other components.

Quality ASTM C1728	WedGel WAG 650EV	WedGel 350EV
Type	Pad / Sheet / Wrap	Thin Paper
Base Materials, Volume of Aerogel, %	≥ 90	≥ 90
Thickness, mm	3 - 10	0.2 - 3
Operating Temperature Range, ºC ASTM C411/C447	-50 to 650	-200 to 400
Long term Temperature Range, 1 Hour, °C	≥ 700	≥ 500
Density, Kg/M3	210± 42	250± 30
Thermal Conductivity, ASTM C177, GB/T10295/4-2008		
W/m.K at 25°C	0.018	0.021
W/m.K at 37.8°C	0.022	0.023
W/m.K at 100°C	0.023	0.024
W/m.K at 200°C	0.028	0.031
W/m.K at 300°C	0.032	0.035
W/m.K at 400°C	0.047	NA
W/m.K at 500°C	0.058	NA
W/m.K at 600°C	0.068	NA
Fire Proofing Rating GB/T 8642-2012	A1	A1
Hydrophobicity GB/T 10299-2011, %	99	99
Compression Strength, ASTM C165; GB/T 13480-2014 at 10%, Kpa	60	105
Compression Rebound rate, 100kPa, 5 Min, %	≥ 90	≥ 90
Tensile Strength, Transverse Longitudinal GB/T17911-2006, Mpa	≥ 0.8	1.4
Complies with ROHS regulation	Complies	Complies
Size Tolerances, ASTM C1728	Pass	Pass
Reaction to fire, ISO 1182, GB/T8624-2012, EN 13501-1	Non-combustible	Non-combustible
Flame spread index (ASTM E84), max FSI	≤ 25	≤ 25
Smoke developed index (ASTM E84) , max ASTM E84 SDI	≤ 50	≤ 50
Adhesive Peel Strenght ASTM-D333, N/100mm	≥ 50	≥ 50
Breakdown Voltage, kV/mm	≥ 10	≥ 10
Volume Resistivity, Ω-cm	≥ 1 x 10^13	≥ 1 x 10^13
Short term Temperature Range, °C No melting, No decomposition, No sintering of the material in 5 Min	1400	≥ 1200
Material Flam retardant, IEC 60695-11-10-1999; Horizontal Combustion meets the HB Level & Vertical Combustion meets V0 Level	Pass	Pass
Requirements for restricted use of hazardous substances in products, (EC) No 1907/2006/ Q/WH 110001-2017	Pass	Pass

It's worth noting that integrating WedGel Aerogel insulation into EV batteries requires careful design and engineering considerations to ensure proper installation and compatibility with battery system requirements. Factors such as the specific formulation of WedGel Aerogel, its structural integrity, and its ability to withstand the operating conditions within the battery pack must be taken into account. For correct installation practice always consult with Wedge Technical team or authorised applicators.

WedGel CAC350 | Carbon Aerogel Composite

Carbon fiber-reinforced carbon aerogel composites for thermal insulation, incorporating oxidized polyacrylonitrile (PAN) fiber felts, are advanced materials designed to provide exceptional thermal insulating properties. It is a flexible, insulation material manufactured from oxidized polyacrylonitrile fibers and SiO2 aerogel. It is manufactured through an innovative, high technology nano-composite process. This composite thermal barrier has ultra-low thermal conductivity, excellent hydrophobicity, is environmentally safe, flame-resistant, easy to cut and easy to use in thermally protective applications. It is the most effective thermally insulative material, that is also easily processed in the end use application, to effectively insulate against fire and high heat, while maintaining minimum thickness. Carbon aerogel composites refer to materials that combine carbon aerogels with other substances to create new materials with enhanced properties.



Features and Benefits

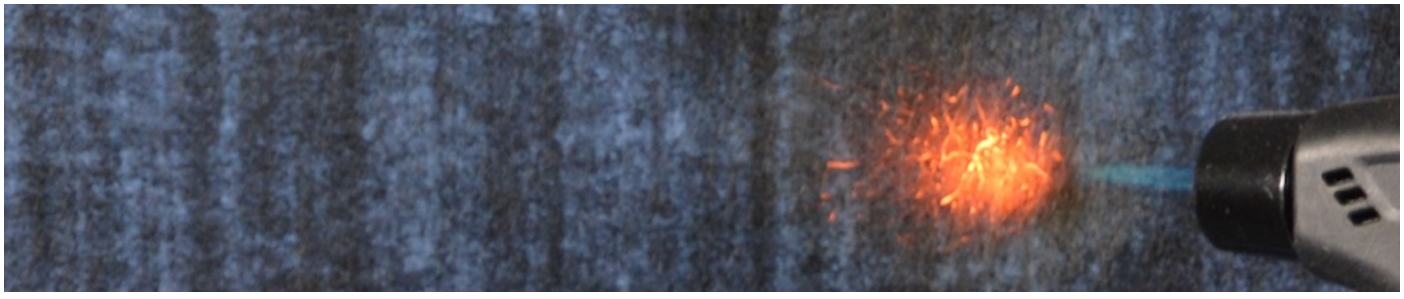
Carbon fiber-reinforced carbon aerogel composites (C/CAs) for thermal insulators were prepared by copyrolysis of resorcinol-formaldehyde (RF) aerogels reinforced by oxidized polyacrylonitrile (PAN) fiber felts. The RF aerogel composites were obtained by impregnating PAN fiber felts with RF sols, then aging, ethanol exchanging, and drying at ambient pressure. Upon carbonization, the PAN fibers shrink with the RF aerogels, thus reducing the difference of shrinkage rates between the fiber reinforcements and the aerogel matrices, and resulting in C/CAs without any obvious cracks. The three point bend strength of the C/CAs is 7.1 ± 1.7 MPa, and the thermal conductivity is 0.328 W m(-1) K(-1) at 300 °C in air. These composites can be used as high-temperature thermal insulators (in inert atmospheres or vacuum) or supports for phase change materials in thermal protection system.

- **Low Density:** Carbon aerogels have an incredibly low density due to their high porosity. As a result, composites incorporating carbon aerogels will generally be lightweight.
- **High Surface Area:** The porous nature of carbon aerogels results in a large surface area, which can be advantageous for certain applications.
- **Good Thermal Insulation:** Carbon aerogels are known for their excellent thermal insulating properties, making them useful in applications where heat resistance is essential.
- **Mechanical Strength:** While carbon aerogels are generally fragile, their mechanical strength can be improved when used as part of composites.

Quality	WedGel CAC350
Type	Roll, Sheet
Service temperature, ºC	350
Colour	Black
Thickness, mm	1-25
Short term Temperature Resistance, ºC	1200
Density, kg/m3	150 - 210
Compression Strength, MPa	1.75
Thermal conductivity	
W/m.K at 25°C	0.021
W/m.K at 100°C	0.023
W/m.K at 200°C	0.028
W/m.K at 300°C	0.035
W/m.K at 350°C	<0.04
Hydrophobicity GB/T 10299-2011 %	>93
Complies with ROHS regulation	Complies
Banned Substances in Vehicles	None
Flammability Rating, UL 94-2013	UL94-V0
Halogen Content	None
Coverings Options	As required
Flashover without breakdown, Leakage current ≤1mA	3820V DC, 60s
Insulation Resistance 2500V DC, 60s	≥500MΩ

Applications

- EV Batteries Insulation and Fire Protection.
- High strength Insulation application.
- Automotive Noise, Heat and Vibration Liners.
- Welding Drapes and Heat Insulating Blankets.
- Flame and Electric Arc Resistant Apparel.
- Acoustical, Heat and Flame Resistant Insulation.
- Heat and Thermal Protective Apparel.
- Runaway Thermal Barriers for Electric Vehicle Batteries.
- Heat and fire protection in Electric Vehicle Batteries.
- High performance Insulation gaskets.
- Cold Box, Shipping Boxes, Cold Rooms.
- Cold chain transportation vehicles.
- Cold storage, shipping containers.
- Heat insulation protection between battery cells.
- Industrial containers, pipes, and for the shell.
- Phase change materials in thermal protection system.



WedGel Powder | Aerogel Insulation Powder & Granules

WedGel Aerogel powder are granules of Aerogel material made of silica aerogel particles having a nano- porous structure. WedGel Aerogel, in its original form, is a highly porous solid material with a gel-like structure, typically composed of a network of interconnected nanoparticles or fibers. When the liquid component of the gel is removed through a drying process, it results in an WedGel Aerogel with a high porosity and low density. It is high porosity and ultra-low density, high specific surface area, ultra-high pore volume. All these advantages make this material have super excellent performance on thermal insulation, acoustic insulation, adsorption, environmental protection, flame retardant and hydrophobic, and other fields.

Features & Benefits

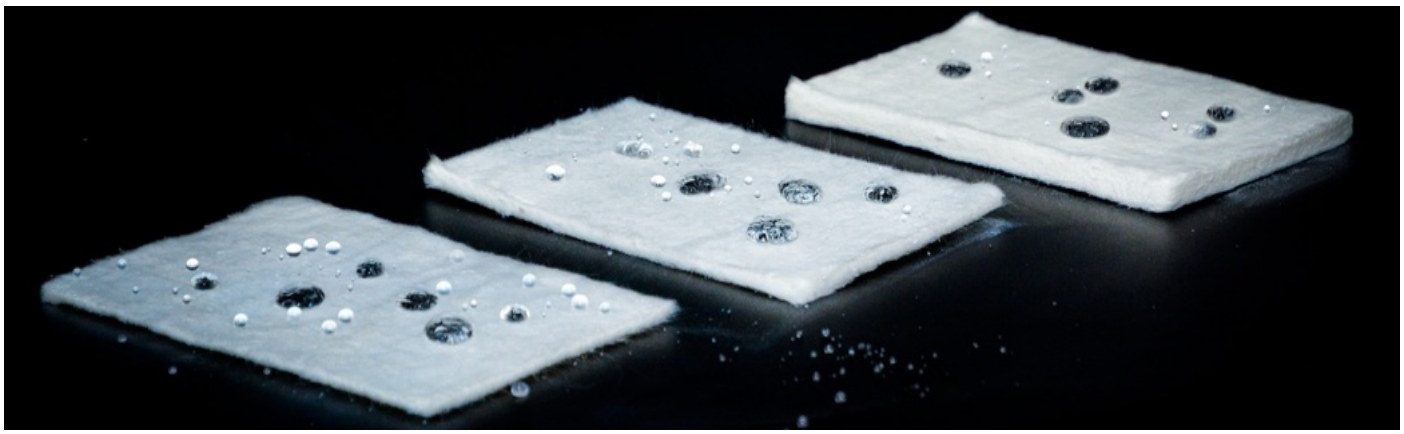
WedGel Powder has thermal conductivity less than 0.018W/m•K and very high hydrophobicity with water repellence rate ≥90%. Its light weight with porosity as high as 90%. The product is composed of inorganic materials, does not contain harmful substances to the human body, and is safe and reliable.

- **High Porosity:** Like WedGel Aerogel in its solid form, WedGel Aerogel powder retains the high porosity that characterizes WedGel Aerogel materials. This porosity contributes to its excellent thermal insulation properties and low density.
- **Low Density:** WedGel Aerogel powder is lightweight due to its low density. This makes it an attractive material for various applications where weight reduction is desirable.
- **Ultra-low thermal conductivity:** WedGel Aerogel powder retains the exceptional thermal insulation properties of WedGel Aerogel. Its low thermal conductivity helps to minimize heat transfer and makes it suitable for use in thermal insulation applications.
- **Versatile Applications:** WedGel Aerogel powder can be used in a wide range of applications. It can be incorporated into paints, coatings, or composite materials to enhance their thermal insulation properties. It can also be used in the production of WedGel Aerogel blankets, panels, or other insulation products.
- **Processability:** WedGel Aerogel powder is highly processable due to its fine particle size. It can be easily mixed or dispersed into various liquid or solid matrices to create composite materials with improved insulation capabilities.

Quality	WedGel WAP20	WedGel WAP60	WedGel WAPM19	WedGel AG Bead
Colour	White	White	White	White
Thermal Conductivity, W/m·K at 25°C	0.016 - 0.018	0.019	0.019	0.016 - 0.019
Specific surface area, m2/g	600 - 800	360	600 - 800	300 - 500
Bulk density, kg/m3	20 - 100	60	60	100 - 200
Particle size	15 - 50 µm	11 µm	2 - 20 µm	1 - 6 mm
Pore Hole diameter, nm	20 - 50	30	20 - 40	20 - 25
Porosity, %	90 - 95	95	90 - 98	80
Surface properties	Hydrophobic	Hydrophobic	Hydrophobic	Hydrophobic

Applications of Aerogel Powder

- Insulation coating and water based aerogel slurry.
- Polyester slice and functional polyester film.
- Insulation foam sheet filler.
- Purification adsorption function packing.
- Reduce the density of composite insulation material.
- Enhance fire resistance of various materials.
- Enhance thermal insulation performance of gypsum boards
  Insulation and hydrophobic coatings



WedGel WJ120, WJ400 | Aerogel Coating, Spray, Paint, Paste

WedGel WJ120 and WJ400 are thin layer or coating applied to a surface that incorporates WedGel Aerogel material. The WedGel coat is designed to provide specific properties, such as thermal insulation, moisture resistance, or protection, to the coated surface. WedGel Aerogel can be incorporated into paint formulations to enhance certain properties of the paint, such as thermal insulation, fire resistance, or acoustic damping. Aerogel paint is an innovative product supplied by Wedge is high performance insulation coatings for the areas where panels cannot be applied. The WJ120 Degree grade Aerogel spray is organic polymer based Silica Aerogel Coating for low temperature resistance in industrial use. WJ400 grade aerogel coating offers high insulation up to temperature 400 °C. The coating is a viscous paste which can be applicated by spraying, smearing, scraping, batching, or simply with paint brush.

Features & Benefits of Aerogel Coatings

- **High Thermal Insulation:** WedGel Aerogel paint incorporates WedGel Aerogel particles, which have excellent thermal insulation properties. The WedGel Aerogel particles help to reduce heat transfer through the coated surface by minimizing thermal conductivity. This can help in reducing heat loss or gain, improving energy efficiency, and enhancing thermal comfort in buildings or other applications.
- **Aesthetic Appeal:** In addition to its insulation properties, WedGel Aerogel paint can provide a decorative finish to surfaces. It is available in various colors and finishes, allowing for customization and aesthetic enhancement of coated areas.
- **Moisture Resistance:** Depending on the specific formulation, WedGel Aerogel paint can exhibit moisture resistance properties. This can help protect the underlying surfaces from moisture intrusion, which can contribute to mold growth, deterioration, or other moisture-related issues.
- **Fire and flame retardant:** Inorganic materials can effectively prevent the spread of fire. The combustion level is Class A.
- Safe and environmentally friendly, friendly to the ecological environment. The water-based solvent does not contain volatile harmful substances.
- **Safe and environmentally friendly, eco-friendly:** The material uses water as the solvent, does not contain volatile harmful compounds, the production process and the use of the process is safe and environmentally friendly non-toxic. While foam insulation materials, mineral fiber, glass wool and other materials will produce harmful material residues.
- **Easy construction, low cost:** The construction process of traditional thermal insulation material is 7~15 courses, and the construction process of aerogel material is 5 courses, and the spraying process can effectively reduce the construction difficulty, shorten the construction cycle and guarantee the construction safety.
- **Sound insulation and noise reduction, long service life:** The aerogel coating has good sound insulation and noise reduction function when used on the building, and the different functions of water-based heat-reflecting materials and water- based water-proof materials are synergistic with each other to form a complete heat insulation or heat insulation and water-proof function, and the service life can be as long as ten years.

WedGel Quality	WedGel WJ120	WedGel WJ400
Colour	White	White / Grey
Thermal Conductivity, W/m·K at 25°C	0.038	0.038
Application Temperature Range, ºC	-40 to 120	-40 to 400
Solid Content, %	32 - 35	32 - 35
WFT / Coat (µm), maximum	500	500
DFT / Coat (µm), maximum	175	175
Curing, Wet at 50-85 °C	30 minute / 0.5 mm	30 minute / 0.5 mm
Curing at NTP (20~30oC)	3 hrs./.5mm WFT	3 hrs./.5mm WFT
Dry density, Kg/m3	280 - 320	380 - 450
Dry SiO2, Silica %	90 - 92	90 - 92
Application	Building Paint	Industrial Paint
Construction Temperature Range, ºC	5 - 40	5 - 50
Application usage area Kg/m2	0.7 - 1.5	8 - 10 (10mm)
Fire Performance, Reaction to fire	A2	A
Drying Time, hr	4	4 at 80 °C
Shelf Life, months	6	6

WedGel Aerogel paint offers insulation benefits with a relatively thin layer compared to traditional insulation materials. It can be applied as a thin coat, similar to regular paint, without significantly adding to the thickness or weight of the coated surface. WedGel Aerogel paint can be applied to various surfaces, including walls, roofs, ceilings, and other architectural elements. It is compatible with different substrates such as concrete, metal, wood, and more. This versatility allows for its use in a wide range of applications, including residential, commercial, and industrial buildings.

WedGel | R-value of Aerogel insulation

The specific R-value of WedGel Aerogel insulation can vary depending on factors such as its thickness, density, and composition. However, WedGel Aerogel insulation generally has R-values ranging from R-10 to R-30 per inch (RSI 1.76 to RSI 5.28 per 25 mm). To put this into perspective, traditional insulation materials like fiberglass typically have lower R-values per inch, with values ranging from R-2 to R-4 per inch (RSI 0.35 to RSI 0.70 per 25 mm). This means that WedGel Aerogel insulation can provide significantly higher thermal resistance with a thinner profile, allowing for space optimization and potential energy savings. It's important to note that the stated R-values are approximate and can vary depending on the manufacturer, specific product formulation, and other factors.

WedGel | U-Value of Aerogel

The U-value (or U-factor) is a measure of the rate of heat loss or gain through a material or assembly. It indicates the thermal conductivity of a material and its ability to resist heat transfer. The lower the U-value, the better the insulation performance. WedGel Aerogel insulation is known for its exceptional thermal performance, resulting in low U-values. The specific U-value of WedGel Aerogel insulation can vary depending on factors such as the thickness of the insulation layer, the type of WedGel Aerogel used, and the specific application. Typically, WedGel Aerogel insulation can have U-values ranging from around 0.015 W/m²·K to 0.035 W/m²·K (or 0.0026 Btu/ft²·hr·°F to 0.006 Btu/ft²·hr·°F). These values represent highly efficient insulation, indicating that WedGel Aerogel has a very low rate of heat transfer. Compared to traditional insulation materials like fiberglass or foam, WedGel Aerogel insulation can offer significantly lower U-values for the same thickness.

WedGel | Comparing with Mineral Wool

When comparing WedGel Aerogel insulation with rockwool (also known as mineral wool), there are several factors to consider. WedGel Aerogel insulation offers advantages in terms of higher thermal performance, lower density, moisture resistance, and space optimization. However, it is typically more expensive compared to rockwool. The choice between the two will depend on factors such as project requirements, budget, desired insulation performance, and the specific application.

Thermal Performance: Both WedGel Aerogel insulation and rockwool provide good thermal insulation. However, WedGel Aerogel insulation typically has a higher R-value per inch compared to rockwool. This means that WedGel Aerogel insulation can offer better thermal resistance with a thinner profile, potentially providing more space-saving options.

Density and Weight: WedGel Aerogel insulation is known for its extremely low density, making it one of the lightest solid materials available. In contrast, rockwool has a higher density and is heavier. This difference in density can affect the ease of handling and installation, as WedGel Aerogel insulation is easier to work with due to its lightweight nature.

Moisture Resistance: WedGel Aerogel insulation is naturally hydrophobic and resists moisture absorption, while rockwool is more susceptible to moisture and can retain water. WedGel Aerogel insulation maintains its insulation performance even in damp or humid conditions, making it a better choice for areas prone to moisture.

Fire Resistance: Both WedGel Aerogel insulation and rockwool are fire-resistant materials. They have high melting points and contribute to fire safety by slowing down the spread of flames. However, rockwool is generally more widely used in fire-rated assemblies and has better fire performance ratings in some cases.

Cost: WedGel Aerogel insulation is typically more expensive than rockwool. The cost of WedGel Aerogel insulation can be a limiting factor for some projects, whereas rockwool is generally more affordable and widely available.

Application: Rockwool insulation is commonly used in various applications, including residential and commercial buildings, as well as industrial settings. It is available in different forms, such as batts, blankets, or loose-fill, catering to different installation requirements. WedGel Aerogel insulation is often used in specialized applications where high-performance insulation is needed, such as in aerospace, cryogenics, or extreme temperature environments.

What is Heat transfer?

The heat energy transfer rate through a body is proportional to the temperature gradient across the body and its cross sectional area. In the limit of thickness and temperature difference, the fundamental law of heat transfer is:

Q = λA x dT / dx

Q is the heat transfer (W)
A is the cross-sectional area (m2)
dT/dx is the temperature/thickness gradient (K/m)
λ is defined as the thermal conductivity value (W/m.K)

Even the very best thermal insulation will not block heat completely. Every material will transfer some heat if a temperature gradient exists across its thickness. According to the known laws of thermodynamics, heat will always fl ow from a region of high temperature to one of lower temperature. This is simple physics. The effectiveness of a material as a thermal insulator can be expressed in terms of its thermal conductivity.

Solid Conduction Heat transfer

In a solid, a liquid, or a gas, as individual molecules heat up they vibrate more and more. In solid conduction heat energy is transferred from one adjacent molecule to another by this vibration. The transfer rate is related to the material's density or mass. The higher the mass, the higher the conduction will be. It is also related to the length and cross section of the conduction path. The rate of solid conduction is directly proportional to the cross sectional area of the conduction path, and inversely proportional to the length of that conduction path.

Convection Heat transfer

Convection is heat transfer by bulk movement within a heated fluid such as a liquid or a gas. Free convection is caused by expansion of gas or fluid when heated, causing hot regions to become less dense and buoyant and to rise. Circulation occurs as the hot fluid cools and sinks down again. Free convection systems can be very large and convey massive amounts of heat, for instance in weather systems and the circulation of molten rock inside the earth. The gas or liquid particles may be energised when passing by a warmer solid mass. A classic convector heater is a perfect example (hot air rises, and as it cools down, it falls). Convection currents are avoided by the inability of the air molecules to flow inside the microporous structure. Since a microporous material consists mostly out of entrapped air (> 95%), it cannot act as an intermediary solid material to allow convection of the surrounding air.

Radiation Heat transfer

All objects absorb and emit thermal radiation. Also called infrared radiation, the heat is transferred by the emission of electromagnetic waves. No particles are involved, unlike in the processes of conduction and convection, so radiation can even work through the vacuum of space. This is why we can still feel the sun's heat, although it's 150 million km away from the earth. The hotter an object is, the more infrared radiation it emits. The radiation rate is proportional to the fourth power of temperature, resulting in rapidly increasing heat loss when temperature rises.

Gaseous Conduction Heat transfer

All materials whether solid, liquid, or a gas, have mass and a thermal conductivity and can therefore conduct heat. When gas molecules are heated, the heat energy is converted to kinetic energy and they start moving faster. Gaseous conduction occurs when adjacent gas molecules collide and transfer their kinetic energy. The mean free path of a gas molecule is the average distance it will need to travel before it collides with another molecule. The mean free path of an air molecule at STP is around 93 nm (3.66 x 10-6 inches).



High Temperature Insulation

High temperature insulation materials also known as Industrial Thermal Insulation materials market is driven by growing demand in various end-use industries, such as petrochemical, ceramic, glass, aluminum, and iron & steel. High-temperature insulation materials operate at high-temperature ranges such as 600°C - 1600°C. Petrochemical is the largest and fastest-growing end-use industry of high temperature insulation materials. High temperature insulation materials such as ceramic fibers, insulating firebricks and calcium silicate, which are used in high-pressure steam piping, flanges, boilers, dryers, furnaces and turbines. Most common high temperature insulation materials are ceramic fiber, calcium silicate, insulating firebrick, and others and Ceramic fibers are the leading segment worldwide in the High Temperature Applications.

What is Thermal conductivity λ Lambda value?

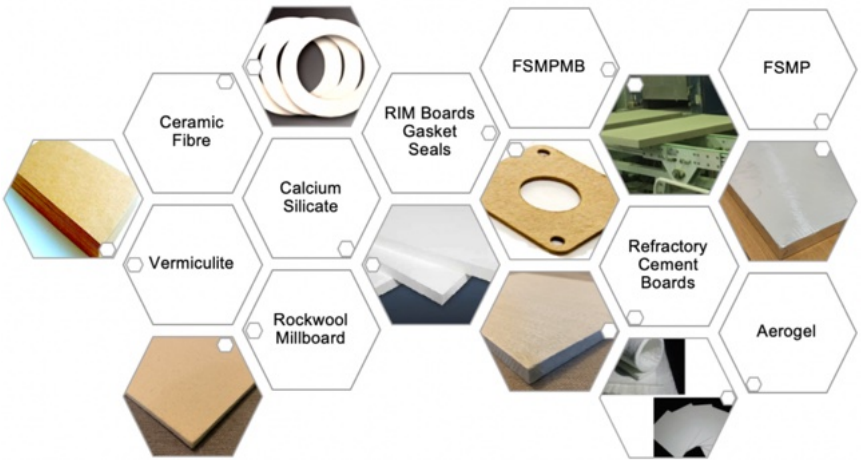
Thermal conductivity is the rate at which heat passes through a specified material, expressed as the amount of heat that flows per unit time through a unit area with a temperature gradient of one degree per unit distance. The thermal conductivity of a material is a measure of its ability to conduct heat. It is commonly denoted by k, \lambda, or \kappa. Heat transfer occurs at a lower rate in materials of low thermal conductivity than in materials of high thermal conductivity. A good high temperature insulator has a very low thermal conductivity at high temperatures. Not all materials transfer heat equally and the thermal conductivity (λ value) of a material is a physical property which describes its ability to transfer heat. The lower the thermal conductivity value, the more resistant a material is to the heat transmission. An insulator therefore has a low thermal conductivity, while a conductor has a high thermal conductivity. Examples of the thermal conductivity of some common materials or substances at ambient temperatures.

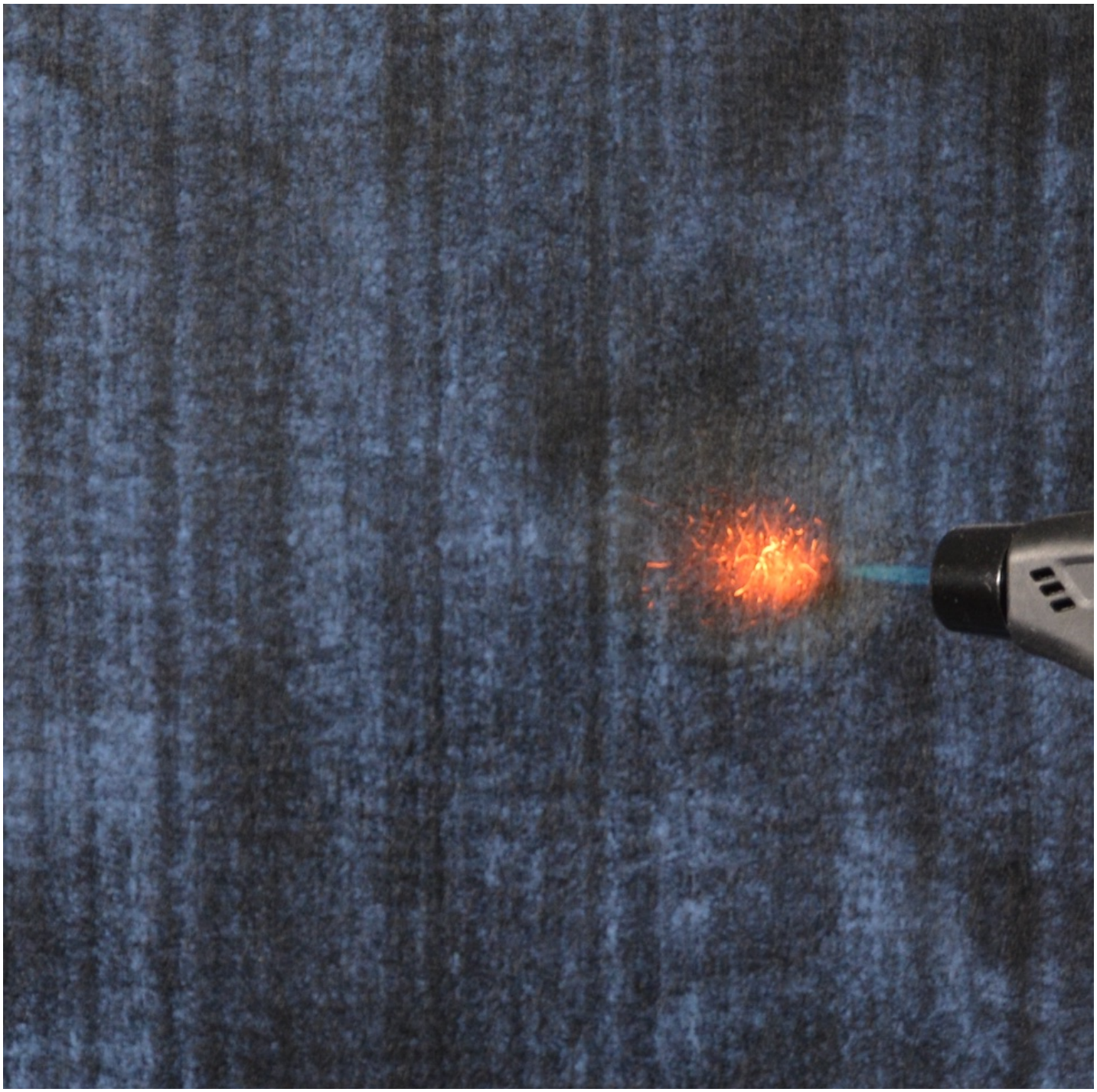
Formula to calculate Thermal Conductivity of any material.
K or λ = Qd / A (T1 - T2)
K = thermal conductivity
Q = amount of heat transferred
d = distance between the two isothermal planes
A = area of the surface
T1-T2= difference in temperature

λ value Copper = an excellent conductor 401 W/m.K
λ value Carbon steel = 54 W/m.K
λ value Glass = 1.05 W/m.K
λ value Air 0.026 = W/m.K
λ value Wedge Microporous insulation = 0.021 W/m.K
λ value Wedge HVIP (High Vaccum Insulation Boards) = < 0.0035 W/mK
λ value of Wedge WedGel Aerogel WAG650 = 0.015 W/m.K

Wedge Insulation Products

- High Performance WedGel Aerogel Insulation Boards, Panels, Blanket, Silica Gel Powder
- Calcium Silicate Board, Calcium Silicate Building Boards, Fire Resistant Calcium Silicate, High Density Calcium Silicate Boards
- Centrifugal Casting Millboards, Ceramic Millboards Discs
- Ceramic Braided Rope Textile, Ceramic Cloth & Fabric, Ceramic Fibre Blanket, Ceramic Fibre Boards, Ceramic Fibre Insulation, Ceramic Paper, Ceramic Wool Bulk Fibre
- Fire Resistant Rockwool Boards, Fire Sleeve, Glass Wool / Fibreglass, Heat Loss Calculator
- Insulation Bricks WETON, Intumescent Fire Door Seal
- MgO Boards for High Temperature Insulation, Fire Door Manufacturing, Partitions, Wall, Roof
- WEDGE RIMB Steel Plant and Aluminium Ladle insulation Boards
- High Performance Low Cost Microporous Insulation, Microporous Pipe Insulation
- Millboard, Non Asbestos Millboards Gaskets, Strips, Discs for Stainless Steel Plant Roller
- Low Density High Strength Perlite Insulation for Cryogenic and High Temperature insulation
- Rigid Foam Spray PUF / PIR Insulation for Wall, Roof,SIP, Cold Storage
- Rigid Insulation Board for Steel Plant Ladles and Tundish Insulation
- Rockwool Insulation, Rockwool Insulation Boards HD for Fire Door Insulation
- Vacuum Insulated Cold Box, Vacuum Insulation Panel Board for Cold Chain Insulation
- Vermiculite Board for Ladle Insulation, Fire Door, Steel Structure Fire Protection
- WAIFLEX Rubber Foam for AC Pipe Insulation, XPLPE Foam Insulation





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