

Hebei Woqin  
Trading Company Ltd.

河北沃勤贸易有限公司

Woqin Trading  
沃勤贸易

Woqin Trade makes the world a better place

沃勤贸易让世界更美好

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## About Us 关于我们

河北沃勤贸易有限公司成立于2024年05月22日，注册地位于河北省石家庄市长安区荣盛中心C座10层，法定代表人为安瑞彬。经营范围包括一般项目：气凝胶产品销售；建筑材料销售；建筑装饰材料销售；防腐材料销售；塑料材料销售；保温材料销售；化工产品销售；五金产品销售；金属制品销售；技术服务、技术开发、技术咨询、技术交流、技术转让、技术推广；货物进出口；技术进出口（除依法须经批准的项目外，凭营业执照依法自主开展经营活动）许可项目：燃气经营。（依法须经批准的项目，经相关部门批准后方可开展经营活动，具体经营项目以相关部门批准文件或许可证件为准）

Hebei Woqin Trading Co., Ltd. was established on May 22, 2024, with its registered address located on the 10th floor of Building C, Rongsheng Center, Chang'an District, Shijiazhuang City, Hebei Province. The legal representative is An Ruibin.

The business scope includes general items: sales of aerogel products; Sales of building materials; Sales of building decoration materials; Sales of anti-corrosion materials; Sales of plastic materials; Sales of insulation materials; Sales of chemical products; Sales of hardware products; Sales of metal products; Technical services, technology development, technology consulting, technology exchange, technology transfer, and technology promotion; Import and export of goods; Technology import and export (except for projects that require approval according to law, business activities can be carried out independently based on the business license) License project: gas operation. (For projects that require approval by law, business activities can only be carried out after approval by relevant departments. The specific business projects shall be subject to the approval documents or licenses issued by the relevant departments.)



## Overview of aerogel 气凝胶概述

Silicon dioxide is a fundamental material that shapes our modern world, existing everywhere in diverse forms. From integrated circuits to glass curtain walls, materials with different structure exhibit vastly different values. Today, we present a project featuring a porous form of silicon dioxide: aerogel. It is a three-dimensional network pore structure formed by the accumulation of silica colloidal particles in space. It is the lightest solid in the world and has the lowest solid thermal conductivity. It is a super insulating material and adsorbent material.

二氧化硅是构成我们今天世界的主要物质，它无处不在形态各异从集成电路到玻璃幕墙不同结构的材料价值差距有着天壤之别。今天我们展示的项目就是一种多孔结构的二氧化硅：气凝胶。它是由二氧化硅胶体颗粒在空间堆积成立体网状的孔隙结构是世界上最轻的固体拥有最低的固态导热系数是一种超级绝热材料和吸附材料。

## Introduction to aerogel 气凝胶简介

Aerogel, also known as dry gel in English, is a gel obtained by chemical solution reaction, forming sol, and then gel. It is a porous material (close to air density) filled with gas in a spatial network structure after removing most of the solvents in the gel. Aerogel is a solid material form, super light, is the lightest solid material known at present, also known as "solidified smoke", "blue smoke". Aerogel is the only choice in some scenarios where the requirements for weight and insulation are very strict.

气凝胶英文名Aerogel，又称为干凝胶，是经过化学溶液反应，形成溶胶，再凝胶化获得的凝胶，是除去凝胶中的大部分溶剂，获得的一种空间网状结构中充满气体，外表呈固体状密度极低的（接近空气密度）多孔材料。气凝胶是一种固体物质形态，超级轻，是目前已知最轻的固体材料，也被称为“凝固的烟”、“蓝烟”。在一些对重量要求苛刻同时对绝热要求极高的场景，气凝胶是唯一选择。

## Characteristics of aerogel 气凝胶特性

1. The porosity is very high, up to 99.8%;
2. Nano scale pores (20-100nm) and three-dimensional nano skeleton particles (2-5nm);
3. High specific surface area, up to 1000 m<sup>2</sup>/g;
4. Low density, can be as low as 0.003g/cm<sup>3</sup>;
5. The unique structure of aerogel determines its extremely low thermal conductivity, which can be as low as 0.012W/(m·K) at room temperature

- 1、孔隙率很高，可高达99.8%；
- 2、纳米级别孔洞(20~100nm)和三维纳米骨架颗粒(2~5nm)；
- 3、高比表面积，可达1000m<sup>2</sup>/g；
- 4、低密度，可低至0.003g/cm<sup>3</sup>；
- 5、气凝胶独特的结构决定了其具有极低的热导率，常温下可以低至0.012W/(m·K)

# Types of aerogels

## 气凝胶种类

## Aerogel felt 气凝胶毡

### Product Introduction 产品介绍

Aerogel felt is a kind of flexible thermal insulation material, which is made of silica aerogel as the main material and compounded in reinforced fibers, such as glass fiber and preoxidized fiber, through special process.

气凝胶毡是把二氧化硅气凝胶为主体材料，并复合于增强性纤维中，如玻璃纤维、预氧化纤维，通过特殊工艺合成的柔性保温材料。



### Product Features 产品特点

Aerogel felt has the characteristics of softness, easy cutting, low density, inorganic fire prevention, overall hydrophobic, green and environmental protection, which can replace the traditional flexible insulation materials with poor environmental protection and insulation performance, such as glass fiber products, asbestos insulation felt, silicate fiber products, etc.

气凝胶毡具有柔软、易裁剪、密度小、无机防火、整体疏水、绿色环保等特性，其可替代玻璃纤维制品、石棉保温毡、硅酸盐纤维制品等不环保、保温性能差的传统柔性保温材料。

### Product advantages 产品优点

1. Excellent insulation effect
2. Reduce the thickness of the insulation layer
3. Hydrophobicity and Fireproof
4. Convenient construction
5. Save transportation costs

1. 优异的隔热效果
2. 减少保温层厚度
3. 憎水性和防火性
4. 施工方便
5. 节省运输费用

### Physical property 物理性能

Thickness: 1-20mm

Width: Approximately 1.5 meters

Density: 160-240kg/m<sup>3</sup>

Applicable temperature: -200 °C~1000 °C (depending on the specific product)

Hydrophobicity: There are two types: hydrophilic and hydrophobic (depending on the specific product)

Thermal conductivity: 0.02~0.1W/(m·k) (depending on the specific product)

厚度: 1~20mm

宽度: 1.5米左右

密度: 160 ~ 240kg/m<sup>3</sup>

适用温度: -200°C~1000°C (与具体产品相关)

疏水性: 有亲水型和疏水型两种 (与具体产品相关)

导热系数: 0.02~0.1W/(m·k) (与具体产品相关)

### Packaging form 包装形式

Roll shaped

卷状

Block-shaped

块状

### Application scope 应用范围

Aerogel felt is mainly used for thermal insulation in the following applications: industrial pipelines, storage tanks, industrial furnace bodies, power plants, life saving cabins, naval ship bulkheads, bullet trains, direct-buried pipelines, injection molding machines, removable insulation sleeves, high-temperature steam pipelines for heavy oil exploitation, transportation, household appliances, steel, non-ferrous metals, glass and other fields.

气凝胶毡主要用于工业管道、储罐、工业炉体、电厂、救生舱、军舰舱壁、动车、直埋管道、注塑机、可拆卸式保温套、稠油开采高温蒸汽管道、交通运输、家用电器、钢铁、有色金属、玻璃等领域的保温隔热。



# Types of aerogels

## 气凝胶种类

### Aerogel block 气凝胶块



#### Product Introduction 产品介绍

Aerogel block is a typical nano porous material, which is a highly dispersed three-dimensional porous solid material with gas as the dispersion medium. Its pore size ranges from 1-100nm, with a porosity of 80%-99.8%, mostly semi transparent, and extremely light in weight. It is also known as "solid smoke" or "frozen smoke".

气凝胶块是一种典型的纳米多孔材料，由胶体粒子或高分子相互聚集而成，以气体作为分散介质的高分散三维多孔固体材料。其孔隙尺寸在1-100nm范围，孔隙率在80%-99.8%，多呈半透明状，质量极轻，也被称为“固态烟”或“冷冻烟雾”。

#### Product Features 产品特点

Aerogel blocks have extremely low density, excellent thermal insulation, good thermal stability, super hydrophobic, low sound speed, unique optical and diverse electrical properties, and multiple production methods.

气凝胶块具备极低密度、卓越隔热、良好的热稳定性、超强疏水、低声速、独特光学及多样电学特性，且制作方法多元。

#### Physical property 物理性能

Porosity: 80%~99.8%

Density: 0.003-0.5g/cm<sup>3</sup>

Large specific surface area: can reach several hundred or even thousands of square meters per gram

Thermal conductivity: 0.01~0.03W/(m·k)

孔隙率: 80%~99.8%

密度: 0.003~0.5g/cm<sup>3</sup>

比表面积大: 可达几百至上千平方米每克

导热系数: 0.01~0.03W/(m·k)

#### Preparation Method 制备方法

Preparation of wet gel: usually, the sol gel method is used. First, the precursor, surfactant and catalyst are dispersed in the solvent. Through hydrolysis and polycondensation, the sol is formed, and then the wet gel with a certain spatial structure is generated.

Drying: mainly includes supercritical drying method, subcritical drying method, atmospheric pressure drying method, freeze-drying method, etc. Due to equipment and cost considerations, atmospheric pressure drying method is often used.

湿凝胶的制备: 通常采用溶胶-凝胶法, 先将前驱体与表面活性剂、催化剂分散在溶剂中, 通过水解、缩聚反应, 形成溶胶, 进而生成具有一定空间结构的湿凝胶。

干燥: 主要包括超临界干燥法、亚临界干燥法、常压干燥法和冷冻干燥法等, 出于设备和成本考虑, 常采用常压干燥法。



#### Application scope 应用范围

Aerospace: Manufacturing insulation materials, heat-resistant tiles, etc. for spacecraft

Industry: Used for insulation and heat preservation of high-temperature equipment and pipelines, which can effectively reduce heat loss and improve energy utilization efficiency

Construction: It can be combined with ordinary glass to create a new type of building material with insulation, fire resistance, flame retardancy, soundproofing, light transmission and other properties

New energy: Used for hydrogen storage and serve as insulation material for thermal runaway of ternary batteries.

航空航天: 制造航天器的隔热材料、防热瓦等

工业: 用于高温设备、管道的保温隔热, 能有效减少热量散失, 提高能源利用效率

建筑: 可与普通玻璃结合, 制成具有绝热、防火阻燃、隔音、透光等性能的新型建筑材料

新能源: 可用于储氢, 还能作为三元电池热失控隔热材料

# Types of aerogels

## 气凝胶种类

### Aerogel powder 气凝胶粉

#### Product Introduction 产品介绍

Aerogel powder is an ultra light and high-performance powder material with nano porous network structure.

气凝胶粉是一种具有纳米级多孔网状结构的超轻、高性能粉末材料。



#### Product Features 产品特点

Aerogel powder has the characteristics of ultra clear density, excellent heat insulation, high porosity and large specific surface area, good chemical stability, unique optical performance, excellent acoustic performance, waterproof and hydrophobic.

气凝胶粉具有超清密度、优异隔热、高孔隙率与大比表面积、良好的化学稳定性、独特的光学性能、出色的声学性能和防水疏水等特性。

#### Preparation Method 制备方法

The sol gel method is used to mix the silicon source, solvent, catalyst, etc. to form a solvent, which is then hydrolyzed and polycondensation to form a wet gel; Then the solvent in the wet gel is removed by supercritical drying, subcritical drying, atmospheric drying or freeze drying, and finally the aerogel powder is obtained. Among them, the atmospheric pressure drying method has lower costs and is suitable for large-scale production.

采用溶胶-凝胶法，将硅源、溶剂、催化剂等混合形成溶胶，经过水解和缩聚反应生成湿凝胶；再通过超临界干燥、亚临界干燥、常压干燥或冷冻干燥等方法去除湿凝胶中的溶剂，最终得到气凝胶粉。其中，常压干燥法成本较低，适合大规模生产。

#### Product advantages 产品优点

1. Energy saving and high performance:Excellent insulation performance significantly reduces energy consumption,with obvious advantages in the fields of energy and construction
2. Design Flexibility:It can be combined with various materials to meet the diverse design needs of different industries and products.
3. Safety & Eco-friendly:Chemically stable,non-toxic and harmless,will not produce harmful substances,and is environmentally friendly.
4. Strong durability:It has good chemical stability and physical properties,long service life,and reduces replacement and maintenance costs.

- 1.节能高效：优异的隔热性能大幅降低能源消耗，在能源和建筑领域优势明显
- 2.设计灵活：可与多种材料复合，满足不同行业和产品多样化设计需求。
- 3.安全环保：化学性质稳定，无毒无害，不会产生有害物质，对环境友好
- 4.耐用性强：具备良好的化学稳定性和物理性能，使用寿命长，减少更换和维护成本



#### Application scope 应用范围

Energy:Used for insulation and heat preservation of solar water heaters, insulated pipelines,industrial boilers,and heat exchangers

Construction:As a building insulation material,it can be added to coatings,boards,and wall materials

Aerospace:Manufacturing insulation materials for spacecraft,satellite components,aerospace engine insulation components,etc

Transportation:Thermal insulation and sound insulation materials for vehicles such as cars and high-speed trains;Used in electric vehicle battery packs

Environmental protection:Used for water treatment and air purification

能源：用于太阳能热水器、保温管道、工业锅炉及热交换器的保温隔热

建筑：作为建筑保温材料，可添加到涂料、板材、墙体材料中

航空航天：制造航天器的隔热材料、卫星部件、航空发动机隔热部件等

交通运输：汽车、高铁等交通工具的隔热、隔音材料；在电动汽车电池组中使用

环保领域：用于污水处理和空气净化

# Types of aerogels

## 气凝胶种类

## Aerogel coating 气凝胶涂料



### Product Introduction 产品介绍

Aerogel coating is an advanced composite material formulated with aerogel as the core functional filler, combined with film-forming resins, additives, solvents and other pigment fillers, and manufactured through high-speed dispersion processes.

气凝胶涂料,是以气凝胶为关键功能性填料,搭配成膜树脂、助剂、溶剂以及其他颜填料,经高速分散工艺制得。

### Product Features 产品特点

Aerogel coating has the characteristics of ultra-efficient thermal insulation, lightweight & eco-friendly, fire-resistant & flame-retardant, noise reduction & sound insulation, adsorption & purification, excellent temperature resistance etc.

气凝胶涂料具备超强隔热保温、轻质环保、防火阻燃、隔音降噪、吸附净化、耐温性好等特点。

### Application scope 应用范围

Walls: Applied to both interior and exterior surface for thermal insulation  
Roofs & Basements: Enhance energy efficiency and moisture resistance  
Industrial: Oil & Gas: Insulates storage tanks, pipelines, and reactors in petrochemical plants  
Power Industry: Protects power generation equipment from heat loss  
Metallurgy: Used in high-temperature furnaces for improved thermal management  
Aerospace: Aircraft structures: Applied to fuselage and engine components for thermal protection  
Transportation  
Automotive: Insulates engine compartments for heat management  
High-Speed Rail & Ship: Improve thermal and acoustic performance in cabins and hulls

建筑:用于建筑内外墙,也适用于屋顶、地下室等部位;工业:石油化工的油储、管道、反应釜,电力行业的发电设备,冶金行业的高温炉等;航空航天:用于飞行器外壳、发动机部件等;交通运输:用于汽车发动机舱、高铁车厢、船舶等

### Product advantages 产品优点

Compared with traditional coatings and thermal insulation materials, aerogel coating have significant advantages in thermal insulation, fire prevention, sound insulation and other properties, and are easy application, long service life, and cost-effective,

相对于传统涂料和保温材料,气凝胶涂料在隔热、防火、隔音等性能上具有显著优势,且施工便捷、使用寿命长、综合成本低。

### Construction method 施工方法

It can be applied by spraying, rolling, scraping, etc. It is easy to apply and can adapt to surface of different shapes and materials.

可采用喷涂、滚涂、刮涂等方式,施工简便,能适应不同形状和材质的表面。

### Construction procedure 施工步骤

Before construction, the base layer should be cleaned to ensure that the surface is flat, dust-free and oil-free; then, according to the type and requirements of the coating, the primer, mid-cost and top-coat should be applied in sequence, paying attention to the drying time and thickness control of each coating.

施工前要先进行基层清理,确保表面平整、无灰尘、无油污;然后根据涂料类型和要求,依次进行底涂、中涂、面涂施工,注意每道涂层的干燥时间和厚度控制。

### Construction precautions 施工注意事项

The construction temperature environment should be between 5 °C and 35 °C, and the relative humidity should not exceed 85%; Avoid construction in adverse weather conditions such as strong winds and rainy days; Pay attention to ventilation and wear protective equipment during the construction process.

施工温度环境应在5℃-35℃之间,相对湿度不高于85%;避免在大风、雨天等恶劣天气下施工;施工过程中注意通风,佩戴防护用品。

# Installation Guide

## 安装指导

### 1. Preparation before construction 施工前准备

#### Material acceptance:

Check the specification, model, thickness and other parameters of the aerogel thermal insulation felt to ensure that it meets the design requirements. For example, high temperature pipes need to use products with corresponding high temperature resistance grades. Check the appearance for damage, cracks, and holes. The surface should be smooth and have a uniform color. If there are defects, they should be replaced in a timely manner. Sampling and testing key performance indicators such as thermal conductivity and hydrophobicity to ensure material quality meets standards.

#### Tool preparation:

Cutting tools: sharp art knives, professional cutting equipment, used for precise cutting of insulation felt. Fixed materials: stainless steel wire, galvanized iron wire, steel strip, etc., selected according to the diameter of the pipeline and working conditions to ensure firm and corrosion-resistant fixation. Sealing materials: sealing tape, silicone sealant, used for joint and interface sealing to prevent heat and moisture from penetrating. Measurement tools: tape measure, caliper, level, assist in accurately measuring pipeline dimensions, ensuring precise installation of insulation felt.

#### Pipeline pretreatment:

Thoroughly remove dirt, rust, and dust from the surface of the pipeline using methods such as sandblasting, wire brushing, and chemical cleaning. For pipelines with heavy oil stains, degrease them first and then polish them. Repair the surface protrusions and depressions of the pipeline to control the outer diameter deviation within the allowable range. Generally, the outer diameter deviation of industrial pipelines should not exceed  $\pm 5\text{mm}$  to ensure a tight fit of the insulation felt.

#### 材料验收:

核对气凝胶绝热毡的规格、型号、厚度等参数,确保其符合设计的要求,如高温管道需选用相应耐高温等级的产品。检查外观有无破损、裂缝、孔洞,表面应平整,色泽均匀,若有缺陷应及时更换。抽样检测导热系数、憎水性等关键性能指标,保证材料质量达标。

#### 工具准备:

裁剪工具:锋利美工刀、专业切割设备,用于精确裁剪绝热毡。固定材料:不锈钢丝、镀锌铁丝、钢带等,依据管道直径与工况选择,确保固定牢固且耐腐蚀。密封材料:密封胶带、硅酮密封胶,用于接缝,接口密封,防止热量三与水汽渗入。测量工具:卷尺、卡尺、水平仪,辅助精确测量管道尺寸,保障绝热毡铺设精准。

#### 管道预处理:

彻底清除管道表面污垢、铁锈、灰尘,可采用喷砂、钢丝刷打磨、化学清洗等方法,油污重的管道先脱脂再打磨。修复管道表面凸起、凹陷,使其外径偏差控制在允许范围内,一般工业管道外径偏差不超过 $\pm 5\text{mm}$ ,保证绝热毡紧密贴合。

### 2. Cutting of insulation felt 绝热毡裁剪

#### Size calculation:

Calculate the width of the insulation felt based on the formula  $C=\pi d$  (where  $d$  is the diameter of the pipeline), taking into account a 30-50mm overlap width on each side. The actual cutting width is the sum of the pipeline circumference and the width of the construction on both sides.

#### Crop operation:

Use cutting tools to calculate the cutting size in sequence. The cut should be neat and straight, avoiding jagged or skewed edges. For large-area cutting, templates can be used to assist in improving efficiency and accuracy.

#### 尺寸计算:

根据管道周长公式 $C=\pi d$ ( $d$ 为管道直径)算出绝热毡宽度,考虑每侧30-50mm搭接宽度,实际裁剪宽度为管道周长加两侧搭建宽度之和。

#### 裁剪操作:

用裁剪工具依次计算裁剪尺寸,切口要整齐、笔直,避免锯齿状或歪斜,大面积裁剪可用模版辅助提升效率与精度。



# Installation Guide

## 安装指导

### 3. Laying and fixing 铺设与固定

Laying sequence:

The straight pipe section is laid section by section along the axial direction, and when there are branches or fittings, the main pipe is laid first and then the branch pipe is laid to ensure continuity and integrity. When laying, pay attention to the direction of the insulation felt fibers being perpendicular to the direction of the pipeline heat flow. If the heat flow of the hot water pipeline spreads outward, the fibers will surround the pipeline in a circular shape.

Fixed method:

Small diameter pipes (less than 100mm) are fixed with stainless steel wire or galvanized iron wire wrapped at a spacing of 150-200mm to ensure a tight and secure fit. Large diameter pipelines (greater than 100mm) should be initially fixed with steel strips at a spacing of 300-500mm, and then tightly wrapped with iron wire to avoid damaging the insulation felt during fixing. At bends, tees, and other pipe fittings, cut them into suitable curved sections and fix them with customized clamps or flexible sealing materials combined with iron wires. The curvature of the clamps should be adapted to the pipe fittings, and sealed with tape to prevent heat leakage.

铺设顺序:

直管段从一段沿轴向逐段铺设,有分支或管件时先主管后支管,确保连续性 & 完整性。铺设时注意绝热毡纤维方向与管道热流方向垂直,如热水管道热流向外扩散,纤维呈环形环绕管道。

固定方式:

小直径管道(小于100mm)用不锈钢丝或镀锌铁丝缠绕固定,缠绕间距150-200mm,保证紧贴不松动。大直径管道(大于100mm)先用钢带初步固定,间距300-500mm,再用铁丝加密缠绕,固定时避免勒坏绝热毡。弯头、三通等管件处,剪成合适弧形段,用定制卡箍或柔性密封材料配合铁丝固定,卡箍弧度需适配管件,垫密封胶带防止热量泄露。



### 4. Interface and seam treatment 接口与接缝处理

Interface sealing:

When installing in sections, align adjacent insulation felt interfaces and tightly wrap them with sealing tape along the interface, with a width of not less than 50mm. Silicone sealant can be applied to high-temperature and high-pressure pipelines to enhance sealing.

Seam treatment:

The longitudinal seams should be staggered by no less than 100mm to avoid heat conduction channels; Horizontal seams should be treated with sealing tape or adhesive, and the seam width can be filled with insulation material debris before sealing to ensure insulation effect.

接口密封:

分段安装时,相邻绝热毡接口对齐,用密封胶带沿接口紧密缠绕,宽度不小于50mm,高温高压管道可加涂硅酮密封胶增强密封。

接缝处理:

纵向接缝相互错开不小于100mm,避免热传导通道;横向接缝用密封胶带或胶处理,缝宽可先填绝热材料碎末再密封,确保隔热效果。

# Installation Guide

## 安装指导

### 5. Installation of protective layer 防护层安装

Selection of protective layer:

Generally, metal protective layers such as galvanized iron sheet and aluminum plate are selected for industrial environments, which have mechanical strength and corrosion resistance; Fireproof asbestos cloth, ceramic fiber cloth, etc. are used in places with fire prevention requirements (such as petrochemical pipelines).

Installation of protective layer:

Cut the protective layer material according to the size of the pipeline, and connect or rivet the metal protective layer with a tight and flat bite, with a riveting spacing of 100-150mm; Non metallic protective layers such as fire-resistant asbestos cloth should be wrapped with appropriate elasticity and fixed with iron wire or tape. After installation, check for looseness or damage and repair them in a timely manner.

防护层选型:

一般工业环境选镀锌铁皮、铝板等金属防护层,具有机械强度与耐腐蚀性;有防火要求场所(如石油化工管道)用防火石棉布、陶瓷纤维布等。

防护层安装:

按管道尺寸裁剪防护层材料,金属防护层用咬口连接或铆接,咬口紧密平整,铆接间距100-150mm;非金属防护层如防火石棉布采用缠绕方式,松紧适度并用铁丝或胶带固定,安装后检查有无松动、破损并及时修复。



### 6. Quality inspection and acceptance 质量检查与验收

Appearance inspection: check whether the air gel thermal insulation felt is laid smoothly and tightly, and whether there is hollowing, cracks and falling off; Whether the moisture-proof layer is damaged or wrinkled, and whether the sealing of the construction joints is intact; Whether the installation of the metal protective layer is firm, and whether there is any deformation, scratches, etc. on the surface.

Thickness measurement: Using tools such as calipers and ultrasonic thickness gauges, randomly select multiple measurement points at different parts of the pipeline to measure the total thickness of the insulation layer (including insulation felt, moisture-proof layer, and protective layer. If the designed total thickness is 50mm, the measured deviation should be within  $\pm 5\text{mm}$ ), ensuring that the design requirements are met and the insulation effect is guaranteed.

Adhesive strength test: Select a certain number of test points, test the adhesive strength between the aerogel insulation felt and the pipe surface by professional tensile test equipment according to the standard method. Generally, the adhesive strength of civil building pipe insulation is required to be no less than 0.1MPa. Industrial pipes have higher requirements according to the specific working conditions, such as the adhesive strength of chemical engineering pipes is not less than 0.2MPa. If it does not meet the standard, rework it in time.

Thermal performance testing: If conditions permit, use equipment such as heat flow meters and infrared thermal imagers to simulate actual working conditions and conduct thermal performance tests on the installed insulation pipelines. Compare the allowable heat loss values in the design, and if actual heat loss exceeds the standard, investigate and modify the quality and installation process of the insulation felt to ensure energy-saving and efficient pipeline operation.

外观检查: 检查气凝胶绝热毡铺设是否平整、紧密,有无空鼓、裂缝、脱落现象;防潮层有无破损、褶皱,搭接处密封是否完好;金属保护层安装是否牢固,表面有无变形、划伤等。

厚度测量: 使用卡尺、超声波测厚仪等工具,在管道不同部位随机抽取多个测量点,测量保温层总厚度(含绝热毡、防潮层、保护层,如设计总厚度50mm,实测偏差应在 $\pm 5\text{mm}$ 范围内),确保满足设计要求,保证保温效果。

粘结强度测试: 选取一定数量测试点,通过专业拉力测试设备,按照标准方法测试气凝胶绝热毡与管道表面粘结强度,一般民用建筑管道保温要求粘结强度不低于0.1MPa,工业管道依据具体工况有更高要求,如化工管道粘结强度不低于0.2MPa,若不达标及时返工。

热工性能检测: 在条件允许下,使用热流计、红外热像仪等设备,模拟实际工况对已安装保温管道进行热工性能测试,对比设计允许的热损失值,如发现实际热损失超标,排查绝热毡质量、安装工艺等问题并整改,确保管道运行节能高效。

# Application area

## 应用领域

## Thermal insulation field

### 隔热保温领域

#### 1. Industrial insulation 工业保温

It can be used for insulation of pipelines, storage tanks, and other equipment in industries such as petroleum, chemical, and power, effectively reducing heat loss and energy consumption. Compared with traditional thermal insulation materials, aerogel thermal insulation materials have thinner thickness, lighter weight and better thermal insulation effect.

可用于石油、化工、电力等行业的管道、储罐等设备的保温，能有效减少热量损失，降低能源消耗。与传统保温材料相比，气凝胶保温材料的厚度更薄，重量更轻，保温效果更好。

#### 2. Building insulation 建筑保温

Adding aerogel to building walls, roofs and other structures can improve the thermal insulation performance of buildings, reduce the energy consumption of air conditioning and heating, and achieve energy conservation and emission reduction. At the same time, aerogel also has a good sound insulation effect, which can improve indoor comfort.

将气凝胶添加到建筑墙体、屋顶等结构中，可提高建筑物的隔热性能，降低空调和暖气的能耗，实现节能减排。同时，气凝胶还具有良好的隔音效果，能提高室内的舒适度。

#### 3. Cold-chain transportation 冷链运输

Used for insulation of cold chain equipment such as refrigerated trucks and cold storage facilities, it helps to maintain a low-temperature environment and ensure the quality of perishable items such as food and medicine during transportation and storage.

用于冷藏车、冷库等冷链设备的保温，有助于保持低温环境，确保食品、药品等易腐物品在运输和储存过程中的质量。

## Aerospace field

### 航空航天领域

#### 1. Aircraft insulation 飞行器隔热

Aerogel can be used as thermal insulation material for aircraft wings, fuselage and other parts, which can withstand extreme temperature changes and protect the internal structure and equipment of aircraft from high temperature. Its low-density characteristics can effectively reduce the weight of the aircraft, improve fuel efficiency and flight performance.

气凝胶可以作为飞行器机翼、机身等部位的隔热材料，能够承受极端的温度变化，保护飞行器内部的结构和设备不受高温影响。其低密度特性还能有效减轻飞行器的重量，提高燃油效率和飞行性能。

#### 2. Space exploration 太空探索

In space probes, satellites and other spacecraft, aerogels can be used for heat insulation, buffering and protection of sensitive equipment.

For example, NASA's Stardust probe uses aerogel to collect cometary dust, and the special structure of aerogel can capture dust particles without damaging them.

在太空探测器、卫星等航天器中，气凝胶可用于隔热、缓冲和保护敏感设备。

例如，美国国家航空航天局（NASA）的“星尘”号探测器就使用了气凝胶来收集彗星尘埃，气凝胶的特殊结构能够在不损坏尘埃颗粒的情况下将其捕获。



# Application area

## 应用领域

## Electronic and electrical field

电子电气领域



### 1. Battery insulation 电池隔热

Aerogel can be used as the thermal insulation material of lithium ion battery, which can effectively prevent the heat transfer generated during the charging and discharging process of the battery, prevent the battery from overheating, and improve the safety and stability of the battery. At the same time, aerogel also has good insulation performance, which helps to avoid battery short circuit and other problems.

气凝胶可作为锂离子电池的隔热材料，能够有效阻止电池在充放电过程中产生的热量传递，防止电池过热，提高电池的安全性和稳定性。同时，气凝胶还具有良好的绝缘性能，有助于避免电池短路等问题。

### 2. Electronic device heat dissipation 电子设备散热

Some high-performance electronic devices, such as computer chips, servers, etc., generate a large amount of heat during operation. Aerogel can be used as a heat dissipation material to quickly dissipate heat, ensure the normal operation of electronic equipment, and improve its reliability and service life.

一些高性能电子设备，如计算机芯片、服务器等，在运行过程中会产生大量热量。气凝胶可以作为散热材料，将热量快速散发出去，保证电子设备的正常运行，提高其可靠性和使用寿命。

## Environmental protection field

环境保护领域



### 1. Water purification 水体净化

Aerogel has a strong adsorption capacity for oil in water, and its porous structure can quickly absorb oil molecules to form a stable adsorption layer, so as to achieve oil-water separation. In addition, the aerogel can also improve the adsorption performance of heavy metal ions through surface modification and other methods, effectively remove harmful heavy metal ions such as lead, mercury, cadmium, etc. in the water, so as to achieve the purpose of purifying water quality.

气凝胶对水中的油污具有很强的吸附能力，其多孔结构能够快速吸附油污分子，形成稳定的吸附层，从而实现油水分离。

此外，气凝胶还可以通过表面改性等方法，提高对重金属离子的吸附性能，有效去除水中的铅、汞、镉等有害重金属离子，达到净化水质的目的。

### 2. Air purification 空气净化

Aerogel can be loaded with activated carbon, photocatalyst and other functional materials for air purifier. While adsorbing harmful gases, it can also decompose some harmful gases into harmless substances through photocatalytic action, such as decomposing formaldehyde into carbon dioxide and water.

气凝胶可以负载活性炭、光催化剂等功能材料，用于空气净化器中。在吸附有害气体的同时，还能通过光催化作用将部分有害气体分解为无害物质，如将甲醛分解为二氧化碳和水。

# Application area

## 应用领域

### Medical and health field

#### 医疗卫生领域



#### 1. Medical thermal insulation 医用隔热

Aerogel has extremely low thermal conductivity, which can effectively block the incoming or outgoing of external heat.

Air gel thermal insulation clothing plays an important role in outdoor medical rescue, infectious disease prevention and control and other special medical scenarios. Air gel heat insulation clothing can effectively block the impact of external high or low temperature on the human body, so that medical staff can keep comfortable in harsh environmental conditions and focus on medical treatment. At the same time, for some patients who need special isolation, the aerogel insulation clothing can also provide a stable temperature environment for patients during the transportation process to prevent the disease from worsening due to temperature changes.

气凝胶具有极低的热导率，能有效阻隔外界热量的传入或传出。

在户外医疗救援、传染病防控等特殊医疗场景中，气凝胶隔热服发挥着重要作用。气凝胶隔热服可以有效阻挡外界高温或低温对人体的影响，使医护人员能在恶劣的环境条件下保持身体舒适，专注于医疗救治工作。同时，对于一些需要特殊隔离的患者，气凝胶隔热服也能在转运过程中为患者提供稳定的温度环境，防止病情因温度变化而恶化。

#### 2. Biological tissue engineering 生物组织工程

In the repair of nerve injury, aerogel can be used as nerve conduit or nerve scaffold material. Its nanoscale pores can simulate the microenvironment of nerve cell growth, providing guidance and support for the growth of nerve axons and promoting nerve regeneration. At the same time, aerogels can also attract neural stem cells to migrate and differentiate to the injured site by surface modification and other methods, combined with biological active molecules such as nerve growth factor, to accelerate the recovery of neural function.

在神经损伤修复中，气凝胶可以作为神经导管或神经支架材料。其纳米级的孔隙能够模拟神经细胞生长的微环境，为神经轴突的生长提供引导和支持，促进神经再生。同时，气凝胶还可以通过表面修饰等方法，结合神经生长因子等生物活性分子，吸引神经干细胞向损伤部位迁移和分化，加速神经功能的恢复。

### Daily life field

#### 日常生活领域

#### 1. Biological tissue engineering 生物组织工程

Air gel thermal clothing is thin, soft and has good thermal performance. Adding the thermal insulation layer made of aerogel material to the down jacket, cotton padded clothes and other clothing can provide better thermal insulation effect while keeping the clothing lightweight, so that people can wear more comfortable in cold weather. In addition, the air gel clothing also has good air permeability, which can discharge the moisture generated by the human body and avoid the wearer feeling stuffy and uncomfortable.

气凝胶保暖服装具有轻薄、柔软、保暖性能好的特点。将气凝胶材料制成的保暖层添加到羽绒服、棉衣等服装中，能够在保持服装轻便的同时，提供更好的保暖效果，让人们在寒冷天气中穿着更加舒适。此外，气凝胶服装还具有良好的透气性，能够排出人体产生的湿气，避免穿着者感到闷热和不适。

# Cooperation commitment

## 合作 承诺

### Service Satisfaction Guarantee 服务满意保障

The company regularly follows up on customer needs to ensure that service quality meets customer expectations. The company's account manager will regularly communicate with clients to understand Customer needs and feedback, timely resolution of issues and improvement of services.

公司定期跟进客户需求，确保服务质量满足客户期望。公司的客户经理将定期与客户沟通，了解客户的需求和反馈，及时解决问题和改进服务。



### Service Support 服务支持

Pre sales professional consultation, precise recommendations; Follow up throughout the sales process and coordinate demand; Quick after-sales response and clarification of doubts.

售前专业咨询，精准推荐；售中全程跟进，协调需求；售后快速响应，解疑释惑。

### Cooperative innovation 合作创新

We are willing to work together to explore the application of new materials and technologies, and jointly promote customized products according to the market. We wish you a leading position.

愿携手探索新材、新技术应用，依市场共推定制产品，祝您领占先机。

**Woqin Trading is willing to work together with you to create excellent results and look forward to cooperation!**

沃勤贸易愿与您携手共进，共创佳绩，期待合作！