



Development and Application of PTFE Teflon Glass Fiber Sintered High Temperature Filter

Polytetrafluoroethylene (PTFE) has many excellent properties.

- A. Excellent high and low temperature performance, widely use temperature range, from $-190^{\circ}\text{C} \sim 260^{\circ}\text{C}$.
- B. High chemical stability, it can withstand all strong acid and alkali except for molten alkali metal and fluorinated media, including aqua regia, strong oxidants, reducing agents and various organic solvents.
- C. Outstanding non-stick and lubricity, all the known solid materials can not adhere to the surface, it is the smallest surface energy of solid material.
- D. Excellent resistance to atmospheric aging, radiation resistance, low permeability.
- E. Good noncombustibility, its limited oxygen index below 90.
- F. Good waterproof performance.

PTFE has very good heat resistance and chemical resistance, but the physical terms, its strength is not very good, but from physical point of view, its strength is not very good, in high temperature conditions, the dimensional stability of the material is not stronger than other materials.

Glass fiber brittle easy to break, wear resistance is poor, not resistant to hydrolysis, for some chemical substances such as fluoride, the corrosion resistance is also poor, This makes it as a high temperature filter in the application with great limitations. However, the high strength, heat resistance and dimensional stability of fiberglass cloth is just complementary to PTFE. These two kinds of materials can be formed composite performance and superior strength of high temperature dust filter.

PTFE glass sintering high temperature filter material which used PTFE and fiberglass two materials of their own performance characteristics to research and develop, The principle is using imported PTFE polymer raw materials and other chemical additives, using a special sintering process, This makes the fiberglass cloth with good wear resistance, corrosion resistance and high temperature performance better than the glass fiber. Giving the filter material a good acid and alkali resistance, corrosion resistance, high temperature, abrasion resistance and resistance to flexing and other properties, and the surface is smooth, hydrophobic, dust can not adhere to the filter surface, it is suitable to high temperature, high humidity, high viscosity dust industry or with acid and alkali, corrosive chemical gas industrial dust purification and other conditions of the occasion.





The Technology Characteristics of PTFE Glass Fiber Sintered High Temperature Filter

The filter function and structural features

As the glass fiber brittle easy to break, wear resistance is poor, for some chemical substances such as fluoride, the corrosion resistance is also poor, this makes it as a high temperature filter in the application with great limitations; Another PTFE fiber composite material that has not been sintered is not sufficiently bonded to the glass fibers because of the low crystallinity of the PTFE molecules, PTFE in the glass on the protective layer is easy to fall off, the high temperature resistance, corrosion resistance, hydrolysis resistance, flexibility, wear resistance, bending and other properties are poor to made of filter materials, as a high temperature filter its life is very short.

Fiberglass cloth fiber surface treatment

Fiberglass cloth fibers are generally have pulp, grease and other impurities, if you do not clear the the pulp, self-lubricants, wetting agents, grease and other impurities of fiberglass cloth, or impurity removal is not complete, inadequate and directly impregnated with PTFE, it will affect the quality of the sintering of the filter material, so that the glass fiber cloth and PTFE bond firmness is not good, made of poor performance of the filter. So it should first through a non-physical wear and chemical erosion of the removal process, thoroughly remove the pulp lubricant, infiltrant, grease and other impurities in the fiberglass cloth, so that the glass fiber cloth fiber surface smooth, clean, can effectively improve the adhesion of PTFE and glass and firmness.

PTFE glass sintering process characteristics

After pre-treatment of fiberglass cloth and PTFE, using sintering process, after several times sintering, so that the fiberglass filter cloth in each fiber surface are wrapped in a layer of dense PTFE protective layer, and the preparation of the PTFE solution by adding other chemical additives, it has been control the appropriate sintering temperature, speed, pressure and other processes, enhanced the adhesion strength and softness of PTFE and fiberglass substrate. As the PTFE molecular with high crystallinity, fiberglass surface PTFE crystallize uniform, PTFE is very firmly bonded to the glass fiber, which greatly improves the filter of the folding, corrosion resistance, wear and strength properties. Equipment bag filter can not only broaden its scope of application, but also greatly extend its service life.

Laminating process and effect

In order to further improve the working life and filtration performance of the filter material, puffed PTFE microporous film can be used, with sintered glass fiber cloth through the high-temperature hot-pressing process melt composite, it is possible to connect the glass fiber cloth, the PTFE protective layer and the PTFE microporous film layer, to form a high degree of high temperature, corrosion-resistant PTFE glass sintered film filter, Its corrosion resistance, folding, wear resistance





has been further improved, the service life is further extended.

The filter material after laminating has the following properties:

A. High filtration efficiency: Microporous films have unique cross-microporous properties, PTFE porous membrane porosity is more than 90%, it has a good filter performance for ultra-fine dust, for $0.3 \sim 1 \mu\text{m}$ and above the fine dust up to 99.99% or more of the filtration efficiency, can achieve near zero emissions.

B. Low running resistance: As the PTFE film itself has non-sticky dust, hydrophobic, chemical stability and other characteristics. After laminating, filter work surface is very smooth, dust stripping performance is very good, especially for the moisture absorption, easy to bond hardening of the dust has a good peelability.

C. Corrosion resistance, folding, wear resistance to further improve: Microporous film and PTFE glass fiber sintered filter compound, with better acid and alkali resistance, high temperature, high humidity and other characteristics.

D. Long service life, large filter rate: Film filter resistance is small and stable, faster filter speed.

Performance of PTFE glass fiber sintered high temperature filter

PTFE glass sintered high temperature filter main components: it is glass fiber + PTFE chemical additives, the technical parameters after the test as shown in Table 1.

Table 1 The technical parameters of PTFE glass fiber Sintered high temperature filter

Item	Index
Standard weight (g/m^2)	750 ± 30
Standard weight CV value (%)	≤ 3
Thickness	0.8 ± 0.08
Thickness CV value (%)	≤ 3
Transverse rupture strength ($\text{N}/5\text{cm}$)	≥ 2000
Tongitudinal elongation at break (%)	≤ 20
Air permeability ($\text{L}/\text{m}^3 \cdot \text{s}$)	$75 \sim 125$
Operating temperature	Long-term working temperature is 260°C Short-term working temperature is 300°C
Hot-shrinkage rate (300°C) (%)	< 0.5
Abrasion resistance	Good
Acid resistance	Excellent
Remains resistance (Pa)	< 400





Collection efficiency (%)	>99
Water-repellent grade (AATCC100)	≥4

Characteristics of PTFE glass fiber sintered high temperature filter

A. High temperature resistance: The temperature resistance of this filter is mainly determined by the the temperature performance of glass and PTFE itself, the long-term use temperature is 260 °C, short-term and instantaneous temperature is up to 300 °C, and heat shrinkage <0.5%.

B. Good acid and alkali resistance: with good resistance for acid and alkaline and most of the organic matter, the resistance for the acidity and other corrosive gases, including hydrogen fluoride is significantly higher than ordinary glass fiber filter.

C. Good wear resistance and fatigue resistance, high tensile strength, and they are all better than ordinary glass fiber filter.

D. Good hydrophobicity: Filter material surface smooth, hydrophobic, any dust can not be attached to the filter surface and easy to clean, resistant to tar and water vapor, Therefore, the dust does not need to do outside insulation. It can be applied to the acid and alkali components, humidity fluctuations in large flue gas dust filter.

E. Good thermal stability: The heat shrinkage is less than 0.5% at 300 °C, this feature determines the safety of its use at high temperatures.

F. High filter speed: The filter material is a smooth cylinder, clogging capacity is small, easy to clean, and also has good wear resistance and fatigue resistance. These characteristics determine that it has a high filtration wind speed, but also determines its competent cleaning method has a backflush cleaning, rotary anti-blowing dust, mechanical vibration cleaning, pulse cleaning and so on.

G. The sintered filter material can be combined with PTFE microporous film into a film filter. With characteristics of high filtration efficiency, easy to clean, acid and alkali resistance, flexibility and so on.

Conclusion

PTFE glass sintered high temperature filter has very good acid and alkali resistance, corrosion resistance, high temperature, abrasion resistance and resistance to flexion and other properties, and the surface is smooth, hydrophobic, dust can not adhere to the filter surface, it is suitable for high temperature, high humidity, high viscosity dust industry or with acid and alkali, corrosive





chemical gas industrial dust purification. PTFE glass sintered high temperature filter in the high temperature flue gas filtration industry has a wide range of uses, the mainly applications:

A. Waste incinerator high temperature, high viscosity dust flue gas purification. Especially waste medical supplies (such as disposable syringes, rubber gloves and so on) and the treatment of domestic waste, it can solve the high temperature burning bags, high viscosity dust paste bags, chemical gas corrosion bags and other issues.

B. Flue gas purification of the Iron and steel smelting blast furnace gas. It is main to solve the high temperature, high humidity, dew point paste bags and high temperature sulfur and other chemical gas corrosion bags and other issues.

C. Carbon black, coking furnace flue gas purification. It is main to solve the high temperature, high viscosity dust caused by cleaning difficulties, after the shutdown of the dew point of the following oxidation reaction to the early embrittlement of the filter and other issues.

D. Chemical industry, metallurgy, cement and other industries. It can solve the high temperature, high viscosity dust caused by the bag filter bag, equipment running resistance, filter early embrittlement damage and other issues.

E. Flue gas dry desulfurization of power plant coal fired boiler, compared with ordinary fiberglass bags. It has good performance of non-stick bag, easy to clean, low running resistance, long service life and so on.

