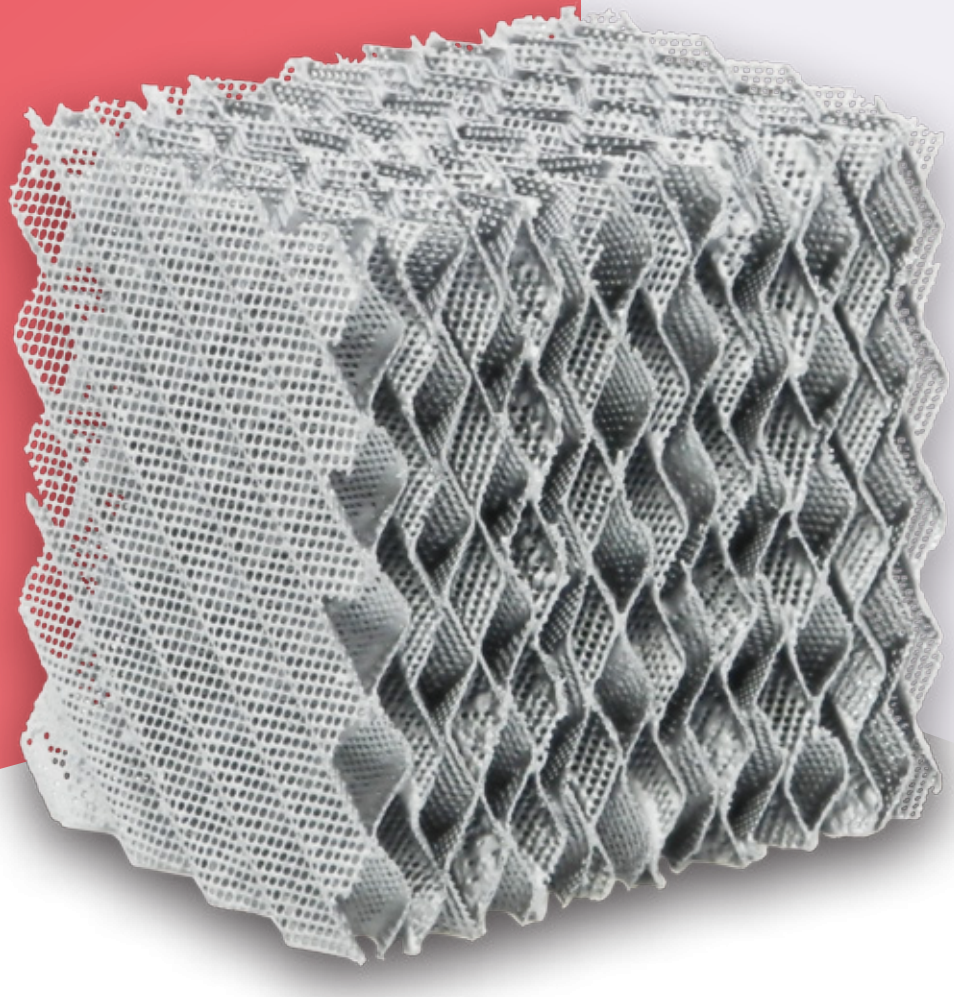
Standard Ceramic

Wire Gauze Packing

The perfect strucutred packing for oil refining, corrosive fine chemicals and pesticide intermediates industries.

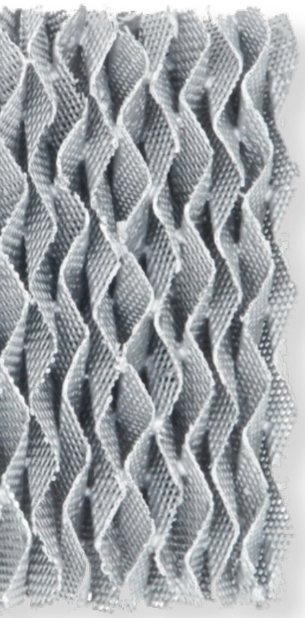
World’s first Silicon Carbide ceramic packing



World’s first
Ceramic wire gauze packing

Advantages

Standard Ceramic’s revolutionary wire gauze packing is made with Silicon Carbide, one of the toughest ceramic material existed. The ceramic packing is characterised by its high specific surface area, excellent mass transfer performance and high separation efficiency. Our packing is able to withstand the most corrisive distillation environment.



High specific surface area

The ceramic wire gauze packing combines the high specific surface area of the traditional metal wire gauze packing and the anti-corrosive nature of Silicon Carbide. Improved mass transfer performance effectively reduces the tower height.

Corrosion resistance

Excellent corrosion resistance makes sure little to none maintenance is required during production, significantly reduces downtime caused by packing malfunction.

Improved safety

Ceramic packing completely eliminates potential spontaneous combustion caused by improper handeling of the metal structured packing during open-tower maintenance, therefore reduces production risks.

Technical Specifications

Bending strength	9 -32 MPa
Compression strength	11 - 60 GPa
Electrical conductivity	5 x 10^{-2} - 5 x 10^{4} W ·cm
Thermal conductivity	16 - 47 W/(m · K)
Specific volume	60% - 90%
Thermal shock resistance	800℃ to 20℃ liquid environment, 20 cycles

SiC Material

Electrodeposition

The making of ceramic packing starts from the skeleton of a special polymer material (such as a sponge) with high porous three-dimensional network structure, the surface of the material is then plated with a ceramic slurry by electroplating, and then sintered in a specially designed furnace.

The original polymer material was removed after sintering, leaving the pure ceramic gauze packing in place. The electrodeposition method is also commonly used for preparing high-porosity ceramic flakes.

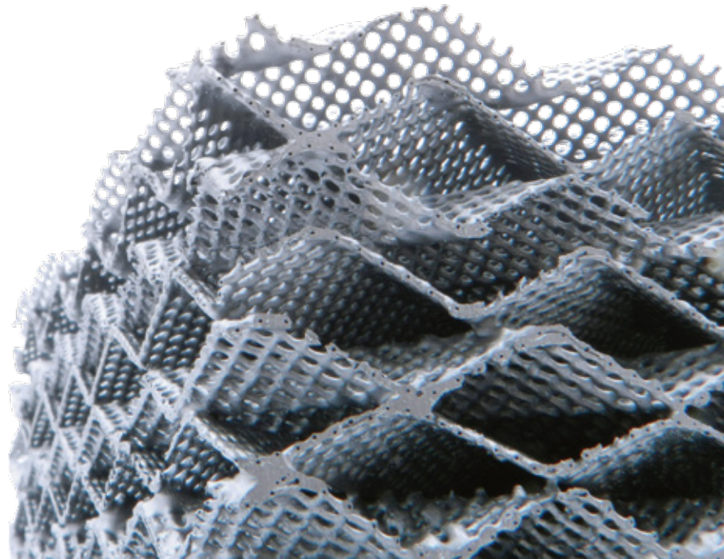
Performance summary

HETP
1 - 2m

Liquid flow
0.05 - 5 gpm/ft^2

Pressure drop
0.1 W.C per theoretical stage

Capacity factor
0.1 - 0.25 ft./sec



Corrosion resistant

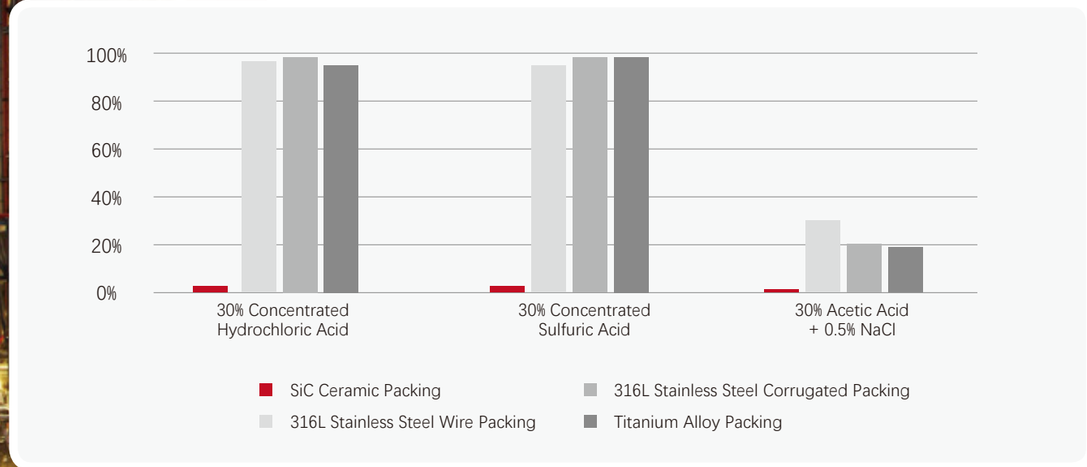
Superior to Titanium

The corrosion resistance of our ceramic structured packing is better than that of various stainless steel and titanium materials.

Typically, by increasing Cr and Mo elements in stainless steel results in an increased corrosion resistance and stability, however in the environment with organic solvents, such as naphthenic acid, the corrosion rate of stainless steel could be accelerated by as much as 10 times. This could reduce the lifetime of stainless steel packing to as short as 4 months in some cases.

Titanium structured packing is somtimes recommended for corrosive environment, however because of its high cost, it is not economically viable for most refineries.

In contrast, Standard Ceramic's wire gauze packing is able to withstand the corrosion of any concentrated sulfuric acid, hydrochloric acid and other organic and inorganic acids. The ceramic structured packing is 10-20 times more resistant than titanium based alloys.



Applications

Atmospheric and vacuum distillation tower Naphthenic acid corrosion

The acid value of crude oil is not directly linked to the naphthenic acid content because the chemical structure of naphthenic acid in different crude oils is often different, as a result they also come with different corrosivity. It is generally believed that when the acid value is greater than 0.5 mg · KOH / g, the crude oil can be very corrosive to most metals.

The corrosion of oil refining equipment caused by high acid value oil has now become a major concern of refineries. Among them, the high acid value crude oil represented by Russian, Middle East and Northern China oil has shown particularly high corrosive abilitity on tower internals such as column packing.

Terephthalic acid (PTA) manufacture Solvent dehydration system towers

Acetic acid generally does not corrode the stainless steel packings. However, as the bromine ion concentration in the acetic acid solution increases, the corrosion rate of tower packings starts to accelerate.

During the production of PTA, as part of the production process, bromide is added to tetrabromoethane as reactants. When the concentration of acetic acid is increased to 85% -95%, it becomes more corrosive, and the temperature also plays a role in accelerating the corrosion.

As a negtive active ion, Bromine can stick on the surface of stainless steel and destroy the protective passive film, and forms pitting corrosions. Then Bromine ions are further concentrated in the pit, which results in deeper pitting corrosion.

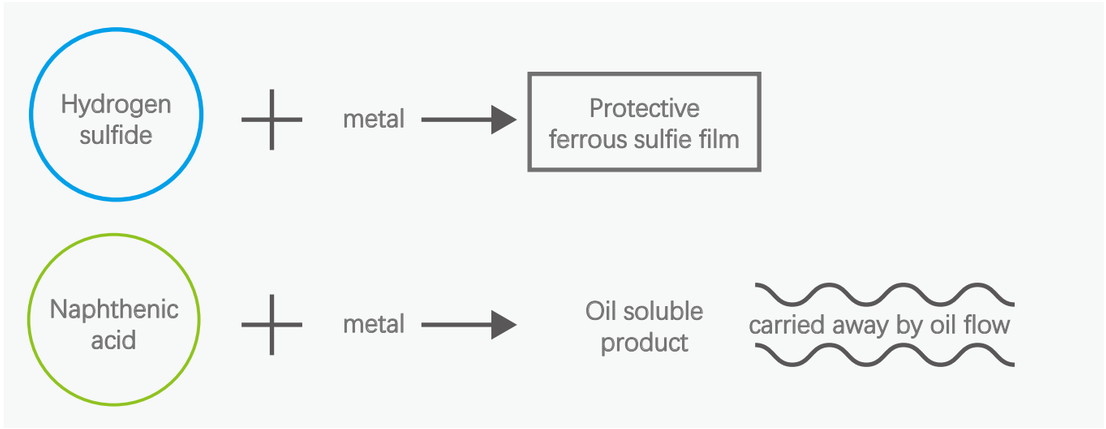
Other applications

Other than the above applications, ceramic wire gauze packing can also help extend the lifetime of tower internals in areas such as concentrated acid productions, pesticide intermediates and

Corrosion mechanism

How is 316L stainless steel corroded in refinery distillation towers?

Hydrogen sulfide is a weak inorganic acid and naphthenic acid is a weak organic acid, the reaction of hydrogen sulfide with metal will produce a protective ferrous sulfide film, naphthenic acid is different, and the product produced after reaction with metal is oil Soluble, can be taken away by oil flow.



Naphthenic acid is not corrosive to metals at room temperature, but can react with iron and form naphthenate at high temperature, this process causes severe corrosion.

The corrosion of naphthenic acid starts at 220 ℃, and the corrosion gradually increases with increasing temperature till 400 ℃

At 270 ~ 280 ℃: Corrosion first increases and then decreases after;
At 340 ~ 350 ℃: Corrosion continue increasing and reach the highest at 350 ℃;
At above 400 ℃: Corrosion not common, because the naphthenic acid in crude oil has been mostly gasified.

The corroded stainless steel packing causes uneven liquid dispersion, which further deepens the corrosion and reduces the gas-liquid exchange efficiency of the entire tower. In severe cases, the stainless steel packing in the tower collapsed, and eventually the tower had to be dismantled for maintenance, which significantly increased the maintenance time and resulted in delayed production.

Also available

Ceramic foam packing

Fully acid proof

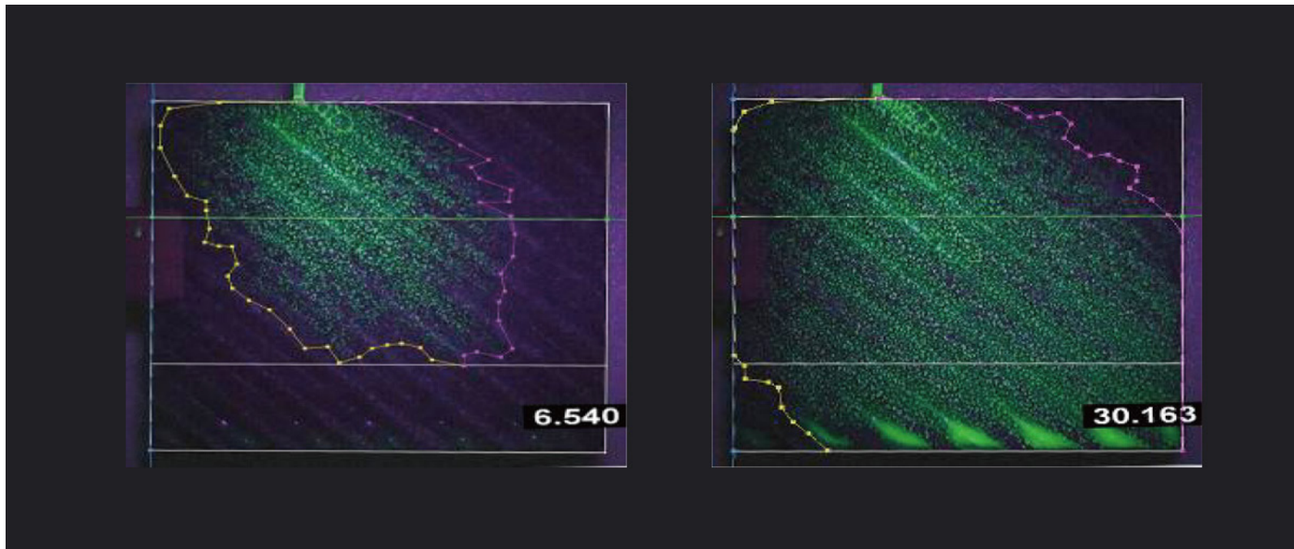
Built with our toughest Silicon Carbide ceramic material, same as the wire gauze packing.

Fast and even liquid dispersion

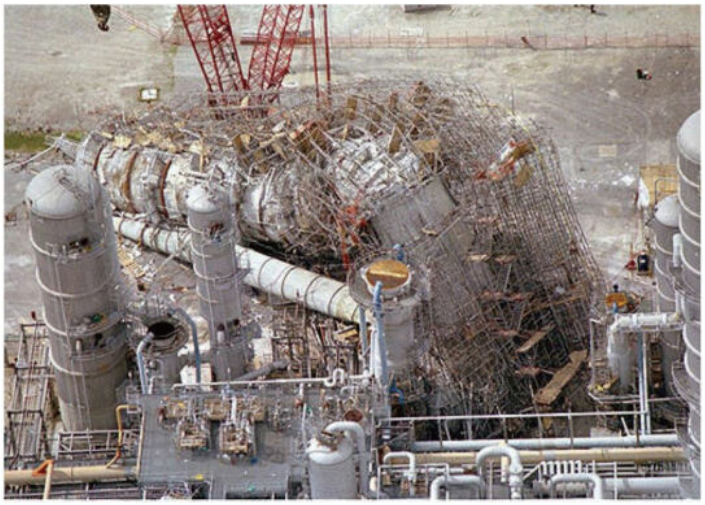
Better liquid dispersion ability than metal packing. As shown in the test below, liquid is uniformly distributed across the packing.

Extremely high specific surface area

The ceramic foam packing is made with our patented technology, which generates interconnected 3D pore structure with adjustable pore size and porosity. The result is a very high specific surface area and distallation efficiency.



Further reading
Steel packing spontaneous combustion



Many oil refinery towers are prone to spontaneous combustion due to improper handling during open-tower maintenance.

Typical steel packings have the tendency to react with sulfur containing oil, this generates FeS_2 as a product.

Typical cleaning process uses steam purge, which gasifies the oil film on the surface of FeS_2, this leaves FeS_2 in direct contact with O_2.

As tower opens for maintenance, large amount of oxygen enters the tower and reacts with iron sulfide ,which has strong reducibility, produces a strong redox reaction and emit a lot of heat. The heat is enough to burn the low-boiling light flammable components in the residue.

Spontaneous combustion (such as iron sulfide) will be deposited on the surface of the packing during the operation of the tower, and it is difficult for the traditional cleaning method to completely remove the spontaneous combustion.

In some cases, the process of new packing installation may also have fire hazrds, as new packings has a layer of combustible lubricating oil film, sparks generated by welding, cutting, grinding and other operations above the packing can easily cause fire as well..

To prevent the ferrous sulfide from filling naturally during the shutdown, the vacume distillation tower should be cooled to ambient temperature, then purged with inert gas, and then cleaned to remove all residues. This ensures the ferrous sulfide is passivated to prevent fire.

Ceramic packing from Standard Ceramic eleminates the risk of spontaneous combustion by using chemically stable, non-flammable Silicon Carbide material, and with our revolutionary wire gauze design, we make sure the packing combines the high efficiency of tradtional metal wire gauzr packing and the corrosion resistancy of the traditional ceramic packing.

SiC Ceramic packing

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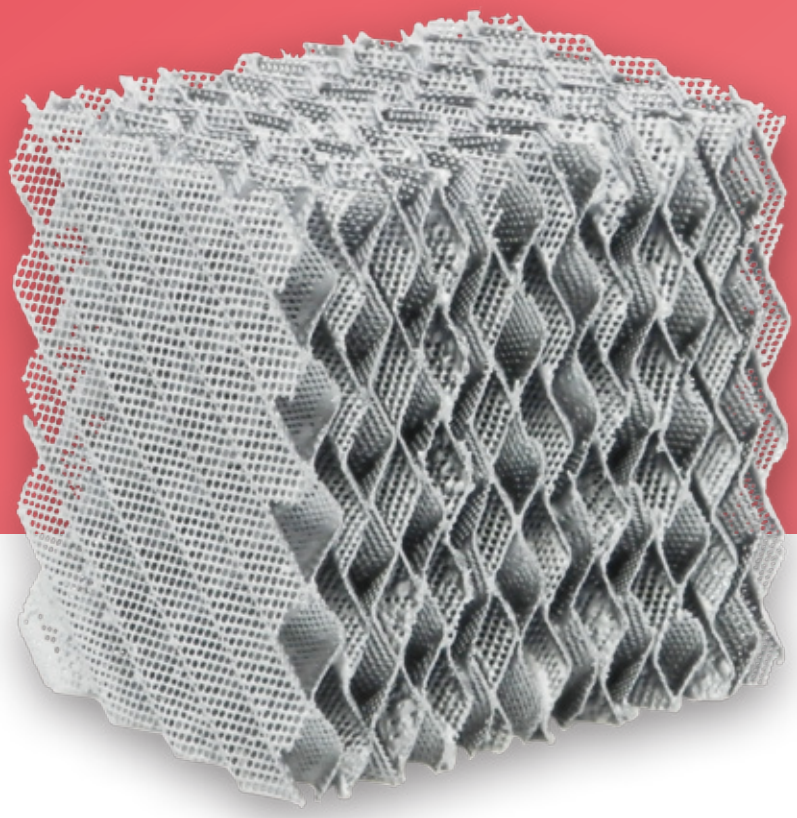

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